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People & the Planet

Volume 7 Number 2

YEAR OF THE OCEAN

Front cover: Bottlenose dolphin and coral reef, Belize
Credit: Doug Perrine/Planet Earth Pictures
Left: A garden of hard corals, Tua Marine National Park, North Sulawesi, Indonesia
Credit: Fred Bavenden/Still Pictures

People & the Planet

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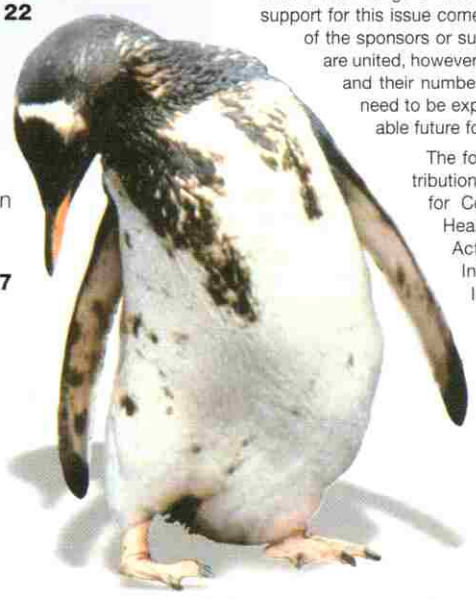

Power of the people

Human mind-sets sometimes take a long time to catch up with the reality of the world we live in. The 'limitless' expanse of the oceans and the long-cherished 'freedom of the seas' has tended to blind us to their vulnerability to human activities at the end of the 20th century. It has made many people and politicians careless of their responsibility for the oceans and thoughtless of the fact that the sea is the ultimate source of life on earth. Concern with the land and its wildlife goes back a long way. The oceans have rather been seen as a bottomless sink, and its creatures as endlessly available – not as the precious wildlife which they are. As Don Hinrichsen details in his overview to this issue, partly through simple ignorance and inertia we are massacring fish stocks and poisoning the oceans as if there was, indeed, no tomorrow.

A similar thought was put by Federico Mayor, Director-General of UNESCO, when he launched 1998 as the International Year of the Ocean: "For the human imagination, the sea has always been a symbol of vastness and freedom. Now, at the close of the second millennium, competition for scarce resources is showing this freedom to have its limits." The purpose of the Year is to focus the attention of people and governments on the importance of the marine environment for sustainable development and "to obtain commitments from governments to take action, provide adequate resources and give priority to the ocean and coastal areas which they deserve..." This, says UNESCO, is most important "in view of the increasing threats of pollution, population pressure, excessive fishing, coastal zone degradation and climate variability to the finite resources that the oceans represent."

The Year will be marked by many events, not least being EXPO '98 in Lisbon. This last exposition of the century, running from May to September, under the theme of The Oceans, a Heritage for the Future, will be a marvellous showcase for the UN agencies and others to exhibit their ocean-related programmes. Many of these, as with the UNEP's Regional Seas Programme, are badly in need of funds and fresh impetus. EXPO, and all the other activities of the Year are hugely worthwhile, because – as many of our contributors emphasise – the political will to deal with complex marine issues is often missing. This Year of the Ocean can, hopefully, mobilise a newly-awakened popular concern. As we report Jacques-Yves Cousteau saying, 20 years ago: "The more people, the more power, the more hope."

John Rowley

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The following 'associates' are partners in the development and distribution of *People & the Planet:* AVSC International, Audubon, Center for Communication Programs, Johns Hopkins School of Public Health, Earthwatch, Centre for Development and Population Activities, Family Health International, Futures Group, International Institute for Environment and Development, International Union for the Scientific Study of Population, Pathfinder International, Population Action International, Population Concern, Population Reference Bureau, Royal Swedish Academy of Sciences, Television Trust for the Environment, WWF-Alliance for Religions and Conservation.

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newsfile

Peter Stegnar/IAEA

BACK TO BIKINI

The survivors and descendant of Bikini Island, which nestles within Bikini Atoll in the far northwest of the sprawling Marshall Islands archipelago, may at last be heading home, *writes Gamini Seneviratne.*

They had to leave their island more than 50 years ago, when – between 1946 and 1958 – the United States detonated 23 nuclear test weapons in the atoll, yielding a total of some 70 million tonnes of TNT. Now 10 of the world's leading radiation experts have concluded that Bikini may be resettled; but only provided radiation safety precautions are strictly observed.

It's a tough decision. For most of their enforced exile, the 167 evacuees and descendants have lived on Kili, an isolated island with no protective reef, 800-odd kilometres southeast of Bikini. The land is fertile but the area small (0.8 square kilometres), about half the size of Bikini island.

Traditional fishermen, the Bikinians have reluctantly become farmers because Kili has no lagoon or fishing grounds and its small beach is frequently subjected to high waves. The Bikinians are afraid of staying. Kili lies less than two metres above sea level and indications of global warming and sea level rise have become a certainty.

They are also fearful of going back home. In 1968, President Lyndon Johnson announced, on the basis of radiological findings, that the atoll was safe for re-habitation. Bikini island was cleared of debris and fruit trees were planted. In the early 1970s a total of 139 Bikinians resettled. But barely five years later, in 1978, tests determined that the radioactivity in their bodies had increased tenfold and they were hastily relocated to Kili.

Now a scientific panel appointed by the International Atomic Energy Agency (IAEA) to assess how safe resettlement would be today has given it a guarded okay. But their report, to be published by the IAEA shortly, warns new settlers that locally grown foodstuffs, including fish from nearby waters, should make up less than half of their daily diet.

Additionally, the soil "from around and beneath the dwelling areas" should be removed and replaced with crushed coral to minimise exposures from inhalation or soil ingestion; and potassium based fertiliser, which plants take up in preference to caesium-137 (the only significant remaining radioactivity source) should be periodically applied "in all areas where crops may be grown."

Beyond that, radioactivity in local foodstuffs should be measured regularly and a simple whole body monitor and training to use it should be provided by the IAEA so the settlers could satisfy themselves that their uptake is not significant.

NUMBERS RIDDLE

The recent release of updated UN world population projections to 2150 has led some observers to assume that the "population explosion" is over. The medium fertility scenario put the world's population at 11 billion persons in 2150, 0.7 billion persons fewer than previously published, *writes Carl Haub.*

The UN's fertility scenarios, however, ranged from a low world population of 3.6 billion to a high of 27 billion persons by 2150. "The range of potential demographic outcomes underscores the difficulty of focusing on any particular scenario," the executive summary cautioned.

The recent notion of a stabilising world population is fuelled in part by low fertility in the industrialised countries, particularly in Europe. "Sinking" birth rates everywhere are said to signal that the earth now has a problem with low, not high, fertility. This is simply not the case.

Low fertility in Europe – only 1.2 children per woman in Italy – is a remarkable demographic phenomenon, without question. But the post- war global population explosion has nothing to do with birth rates in any industrialised country. It never has and it doesn't now. The vast majority of population growth since 1950 has been in the developing countries. Today a rather stunning 98 per cent of growth is in those countries.

Long-range population projections show that future world population could climb past 25 billion 100 to 150 years from now or it could even eventually decline. What will make the difference? Just two things. The pace at which fertility falls in developing countries and the level to which it descends. If it falls to about 2.5 children per woman, we will have the higher scenario.

Has world population growth "peaked" as some would have it? That depends, once again, on what the birth rate does. We have had no fewer than seven or eight so-called peaks since 1950 in which the number of people added to world population annually seemed to reach a high watermark and receded – only to begin climbing again. This is due to the vagaries of birth rates, which decrease in some countries for a time and then slow their decline, or to countries which experience a rise. Today's peak may overlook tomorrow's valley, and it says little about the future.

The real truth about the population explosion is that we simply do not know where it will end, presuming that it does.

Carl Haub is Senior Demographer at the Population Reference Bureau in Washington DC.

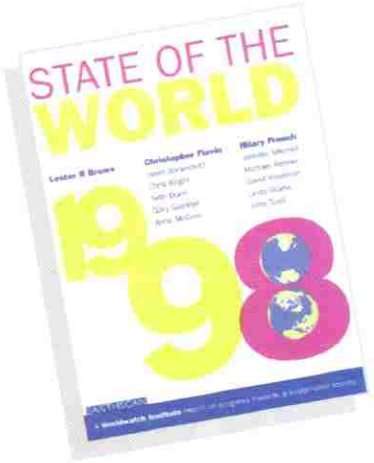
THE NEW ECONOMY

The 15th edition of the Worldwatch Institute's *State of the World* report counts the cost of present economic trends as they outgrow the earth's ecosystem. It calls for the restructuring of the global economy to convert it from a throw-away system to a reuse/recycle one.

It highlights the necessary shift from fossil fuels to solar/hydrogen energy. And it takes hope from the progress already made and signs that industry has begun to change direction.

It says renewable energy is expanding fast. Wind generation is growing by 25 per cent a year, while the market for coal and oil is expanding at only 1 per cent. In Denmark, wind turbines already generate 6 per cent of the nation's energy.

Inventories show that the United States could satisfy all its energy needs



from three wind-rich states, while China could easily double its electricity generation from harnessing the wind. The Japanese firm Tomen plans to invest $1.2 billion in Europe to build 1,000 large wind turbines over the next five years.

Photovoltaic cells are now the source of electricity in some 400,000 homes, mostly in Third World villages. Japan plans to install 4,500 megawatts of rooftop generating capacity using new photovoltaic rootop tiles by 2010. This is equivalent to the entire generating capacity of Chile.

Most encouraging, says Worldwatch President Lester Brown, is the evidence that some of the largest oil companies are buying in. Enron, the large US natural gas company has acquired Zond, the largest wind power company in the country and has invested in Solarex which manufactures photovoltaic cells.

British Petroleum has committed itself to $1 billion in renewable energy and Royal Dutch Shell plans to invest $500 in solar cells and sustainable forestry in developing countries.

But, says the report, change including a restructuring of the tax system and a new commitment to population stabilisation, will need massive support from political leaders and the main sources of information.

State of the World 1998 is published by W.W. Norton in the United States and by Earthscan in the United Kingdom at $13.95 and £12.95.
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RUNNING ON AIR

A car that runs on air, producing zero pollution, was unveiled in France in February. It is due to go into mass production in Mexico later this year, where it will eventually replace Mexico City's 87,000 petrol and diesel taxis.

Invented by Formula One engineer Guy Nègre, at his factory at Brignoles in the South of France, the ZP engine will run on a tankful of compressed air. In trials the engine ran for 10 hours with a top speed of 60 miles an hour, mounted on a Citroen AX chassis. This performance is better than any electric car already in production.

The Mexican taxi model, with a separate compartment for the driver and four rear seats for passengers, has been designed by an Italian company, Dina, which plans to produce some 40,000 ZP taxis and urban delivery vehicles under licence, in Mexico, each year.

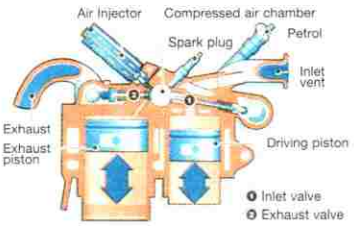
Silent and odour free, the engine was chosen by the Mexican authorities after a worldwide search for a vehicle which would ease Mexico City's pollution problems. Though it is equipped with the usual piston and valves, it is much lighter than an average engine.

It runs on an integrated system in which 300 litres of compressed air can be pumped into the tank under high pressure in three minutes. It is triggered by an air/petrol mixture as in a normal engine, but then runs on air alone.

The car can also be refuelled at home in four hours using a small compressor in the car plugged into the house electricity supply. The cost of the electricity would be about $1.60. The air is free.

According to Mr Nègre "One of the vehicle's advantages is the carbon filtering system, which means that the car sucks in the polluted surrounding air during braking and then breathes out purified air." That is something that is also attracting interest in Holland and elsewhere.

The Guardian, London, January 24,1998 and other sources.



REEF CHECK

A global effort to assess the state of the world's coral resources has been carried out by Reef Check 1997, organised by Hong Kong University. It used professional and recreational divers to chart the health of 300 reefs in 30 countries.

The results are sobering: only 31 per cent of all reefs surveyed had living coral cover, the rest – 69 per cent – were seriously degraded. The Caribbean had the lowest rate of living coral, an average of only 22 per cent.

During 1997, *ReefBase* was formally launched by the International Center for Living Aquatic Resources Management (ICLARM) in Manila, Philippines. *ReefBase* is a computerised database containing information on more than 7,000 coral reefs throughout the world's tropical and sub-tropical seas. *ReefBase* Project Leader, John McManus, claims that the database also contains reports of human-induced stress on 2,000 coral reefs.

This system eventually will allow scientists and policy-makers to pinpoint areas under threat and to help marine biologists identify sites of significant coral diversity that could be set aside as marine parks and protected areas.

ReefBase is available on CD-ROM from ICLARM

FISHERS DOUBLE

The number of people fishing worldwide has more than doubled since 1970, according to a new survey published by the UN Food and Agricultural Organisation (FAO). This compares with an overall growth of 35 per cent in employment in agriculture.

In 1970, around 13 million fishers produced 65 million tons of fish, aquaculture included, FAO said. In 1990, the number of people deriving their income from fishing and aquaculture more than doubled to 28.5 million people, producing 98 million tons. For 1997 FAO estimates that around 30 million fishers and fish farmers produced 116 million tons of fish.

"This growth is mainly related to the increase in the size of fishing fleets and to the expansion of aquaculture," said Adele Crispoldi, FAO fishery statistician. The majority of fishers, 95 per cent, are from developing countries – with 85 per cent concentrated in Asia.

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CLIMATE CONCERN

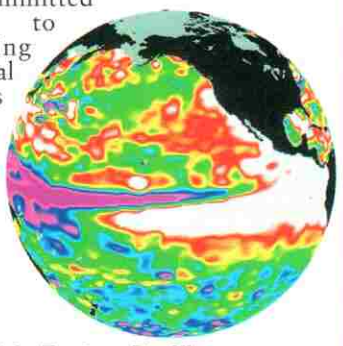
Over 200 top level insurance executives from more than 10 countries met in Tokyo in December to discuss environmental risks – especially the implications of climate change – and the insurance sector. The meeting was held in association with United Nations Environment Programme (UNEP).

The threat of weather-related disasters, like those due to El Niño, are the kinds of events that insurers fear will become more frequent if society continues to emit greenhouse gases into the atmosphere at the current rate. Environmental risk accounts for annual revenues of over US$2 trillion to the insurance sector. Today, natural disasters represent 85 per cent of insured catastrophe losses globally, or US$12.4 billion in 1995, and these losses are on the rise.

UNEP's alliance with the insurance industry was launched two years ago when the first insurance companies signed the UNEP Statement of Environmental Commitment by the Insurance Industry. Today more than 70 countries have signed the statement and have committed themselves to incorporating environmental considerations into their operations.

Women's Feature Service, Delhi, India

Nasa/Science Photo Library



El Niño event in Eastern Pacific

'Humankind is in the process of annihilating coastal and ocean ecosystems, warns **Don Hinrichsen** in this sombre introduction to our special issue marking the International Year of the Ocean.

From the objectivity of space the earth is overwhelmingly composed of water. Land appears almost as an afterthought. The Blue Planet is 70 per cent water, all but three per cent of it salt water. Life on earth first evolved in the primordial soup of ancient seas, and though today's seas provide 99 per cent of all living space on the planet, we know more about space than we do about *Oceanus*, the world ocean.

Part of the problem is the sheer vastness of our watery world. The Pacific Ocean covers 181 million square kilometres, an area twice the size of the former Soviet Union. And its average depth is 4,000 metres. It may also contain more species of plants and animals than all the continents combined.

We are learning more about ocean circulation patterns and how seas regulate climate, but science, so far, has a dim understanding of land-ocean interactions. Little is known about deep ocean basins, other than their mineral potential. Only around one-tenth of 115 million square miles of the sea floor has been explored and chartered. Some scientists estimate that the sea floor alone may contain up to 10 million species, the majority of them undiscovered. But no one knows for sure. *Oceanus* is our last great frontier; there are simply too many unknowns.

What is becoming clear, however, is that the greatest threats to the integrity of our oceans come from land-based activities. Humankind is in the process of annihilating coastal and ocean ecosystems and the wealth of biodiversity they harbour. Worse, the damage is a result of ignorance and inertia as much as outright destructive greed and shortsightedness.

Call of the coast

At the root of the problem, of course, is burgeoning human numbers and their ever-growing needs. Population distribution is increasingly skewed. Recent studies have shown that the overwhelming bulk of humanity is concentrated along or near coasts on just 10 per cent of the earth's land area. As of 1998, over half the population of the planet – about 3.2 billion – lives and works in a coastal strip just 200 kilometres wide (120 miles); a full two-thirds, 4 billion, are found within 400 kilometres of a coast

Take the example of China, the world's most populous nation. Of China's 1.2 billion people, close to 60 per cent live in 12 coastal provinces, along the Yangtze River valley, and in two coastal municipalities, Shanghai and Tianjin. Along China's 18,000 kilometres of continental coastline, population densities average between 110 and 1,600 per square kilometer. In some coastal cities, such as Shanghai, China's largest with 17 million inhabitants, population densities average over 2,000 per square kilometre

In general, with the exception of India, the bulk of Asia's population is coastal. Of the region's collective population of 3.5 billion, 60 per cent – 2.1 billion – live within 400 kilometres of a coast.

The population of Latin America and the Caribbean is even more littoral. The region's coastal states have a collective population of around 610 million, a full three-quarters of them

The ocea

live within 200 kilometres of a coast.

Only Africa has more people living in the interior than along or near coastlines. But even here, demographic patterns are shifting. Over the past two decades, Africa's coastal cities – centres of trade and commerce – have been growing by 4 per cent a year or more, drawing people inexorably out of the countryside. Cities like Lagos, Mombasa, Dar es Salaam, Accra, Abidjan and Dakar have seen their populations explode from in-migration.

Collapsing fisheries

Mounting population and development pressures have taken a grim toll on coastal and ocean resources. Consider the following trends:

- The world has lost half its coastal wetlands, including mangrove swamps and salt marshes. Over the past century, mangrove forests have been decimated: 25 million hectares are estimated to have been destroyed or grossly degraded.
- Seagrass beds have faired little better. Though no overall estimates of damage are available, these underwater meadows are in retreat near virtually all inhabited coastal areas.
- Coral reefs, the rainforests of the sea, are being pillaged in the name of development. Of the world's 600,000 square kilometres of reefs found in tropical and sub-tropical seas, we could lose 70 per cent of them within 40 years.

In 1997, a global effort to assess the status of coral resources was carried out by Reef Check, organised by Hong Kong University. It used professional and recreational divers to chart the health of 300 reefs in 30 countries. The results were sobering: only 31 per cent of all reefs surveyed had living coral cover, the rest – 69 per cent – were seriously degraded. The Caribbean had the lowest rate of living coral – an average of 22 per cent. Southeast Asia came in second, with only 30 per cent of its coral reefs in good to excellent condition (having more than 50 per cent live coral cover).

- Coastal and ocean fisheries are also in serious decline. By 1995, according to the UN Food and Agriculture Organisation (FAO), nearly 70 per cent of the world's marine fish stocks were either "fully-to-heavily exploited, overexploited, depleted, or slowly recovering." Of the world's 15 major fishing regions, productivity in all but two has fallen over the past few years. In the four hardest-hit areas – the northwest, the west-central, and the southeast Atlantic, and the east-central Pacific – catches have dropped by more than 30 per cent since the peak year of 1989, when the world's fishing fleets landed 90 million metric tons of seafood.

Chris Martin/Still Pictures

The Black Sea is well on its way to becoming the world's first genuinely 'dead sea', in terms of biological diversity. Its catches have fallen 10-fold in a decade – from close to one million metric tons in 1982 to around 100,000 metric tons in 1992. Over the 30-year period, 1960-90, the number of commercially valuable species plunged from 26 to five. In

J.P. Nacivet/Planet Earth Pictures

an planet

Above: Shrimp aquaculture, West Bengal, India

Julio Etchart/Still Pictures

many areas, the sea has no exploitable marine fauna left.

In Southeast Asia, "nearly all waters within 15 kilometres of shore are considered overfished," points out Dr Ed Gomez, Director of the Marine Science Institute of the University of the Philippines in Metro Manila. Trawlers, the strip miners of the sea, often precipitate the collapse of fish stocks from years of 'catch-as-catch can'. But it is small-scale and artisanal fishers who often pay the price, and are forced to use illegal and destructive fishing gear, such as poisons, dynamite and fine-mesh nets, to put food on the table.

Tide of pollution

If the chronic over-exploitation of marine resources were not bad enough, rapidly expanding coastal populations and the helter-skelter growth of cities has contributed to a rising tide of pollution in nearly all of the world's seas.

David Drain/Still Pictures

Human activities may be responsible for as much as 35 million metric tons of nitrogen that ends up in coastal waters every year, along with close to 4 million metric tons of phosphorus. With this nutrient pollution comes untold quantities of untreated or partially treated industrial effluents, including heavy metals and organochlorines (such as DDT and PCBs), organic chemicals and eroded sediment torn from the hinterlands.

Overall, some 450 cubic kilometres of waste water are carried into coasts by rivers and streams every year. These tremendous pollution loads require an additional 6,000 cubic kilometres of freshwater to dilute the pollution, an amount equal to two-thirds of the world's total stable runoff.

Coastal urban areas dump increasing loads of wastes into the sea. The waters around many coastal cities have turned into eutrophied cesspools, clogged with pollution, where virtually no marine life survives.

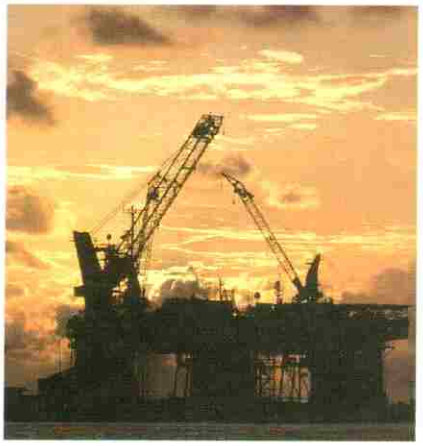
Consider the following examples:

- The Mediterranean Sea is on the receiving end of between 30 and 50 million metric tons of untreated or partially treated sewage every year.
- The Lagoon of Iddo in Lagos, Nigeria, gets 60 million litres of raw sewage a year, along with untold quantities of industrial waste.
- Calcutta and Bombay, India, respectively, dump 400 million metric tons and 365 million metric tons of raw sewage and other municipal wastes into coastal waters every year.
- Karachi, Pakistan, empties 175 million metric tons of sewage and industrial filth into the Arabian Sea every year.
- Along China's seacoast, 50-60 million metric tons of untreated or partially treated municipal wastes flow into coastal waters every day.
- The Bays of Valparaiso and Conçepcion, Chile receive a combined total of 244 million metric tons of untreated effluents a year, mostly from copper mines, pulp and paper mills, fish processing plants and oil refineries.
- In 1990, 1.2 million metric tons of nitrogen and 80,000 metric tons of phosphorus were spilled into the Baltic Sea. Since 1900, nitrogen levels have increased fourfold and phosphorus levels eightfold, in line with intensified industrial and agricultural activities.
- In 1992, Romania dumped 170 million metric tons of liquid filth into the Black Sea, while Turkey discharged 500 million metric tons of domestic and industrial wastes.

Management plans

Ocean currents have transported pollutants into the remotest corners of the world's seas. No place in the world ocean is immune from the depredations of human activities. PCBs and DDT, for instance, have turned up in the fatty tissues and blubber of seals in the arctic and penguins in the Antarctic, thousands of kilometres from population centres.

The crisis of the world's seas is made worse by government inaction and a frustrating inability to enforce


Denis-Huot/WWF/BIOS

existing coastal and ocean management regulations. Out of 218 sovereign states, 177 have a coastline. Yet, only 55 have tried to develop coastal and near-shore management plans. And of these no more than 16 (20 if protectorates, dependencies and territories are included) had managed to implement their management plans by 1996.

Why is coastal and ocean management so difficult? Mainly because these areas contain so many different types of regulations (local, regional and national) and involve so many levels of government, that rational planning and co-ordination of efforts are rendered impossible. In Brazil, for instance, coastal zone planners have to wade through 20 different levels of government. In the United Kingdom, some 48 subnational units of government – from Parliament to town councils – have the authority to create an autonomous or semi-autonomous coastal management strategy.

There are compelling economic reasons to manage these areas sustainably. In the southeastern part of the United States, for instance, tidal marshes are used to filter waste water from single stage sewage treatment plants, a function that makes them worth around $123,000 per hectare (based on the cost of replacing them with two-stage treatment facilities). Coral reefs have been valued at $47,000 per square foot, just for their shore protection functions alone. Studies done in Puget Sound, Washington, discovered that a little over a third of a hectare of eelgrass has a value of over $412,000 annually, based on the amount of energy derived from the system as well as the nutrition the seagrasses generate for oyster culture, commercial and sport fisheries and waterfowl.

If we fail in our attempts to manage and conserve coastal and ocean ecosystems, the consequences could well be incalculable.

There is hope that coastal and ocean areas can be managed more sustainably for the benefit of current and future generations. But concerted efforts needs to be made by national governments and the international community acting together around a common action plan.

Taking the lead

The Law of the Sea Convention, which finally came into force in November 1994, could usher in a new era of ocean management (see pages 22-23). It does afford all coastal states the right to manage marine resources within their 200-nautical-mile Exclusive Economic Zones (EEZs), but most developing countries do not have the means to enforce regulations over such a vast expanse of sea.

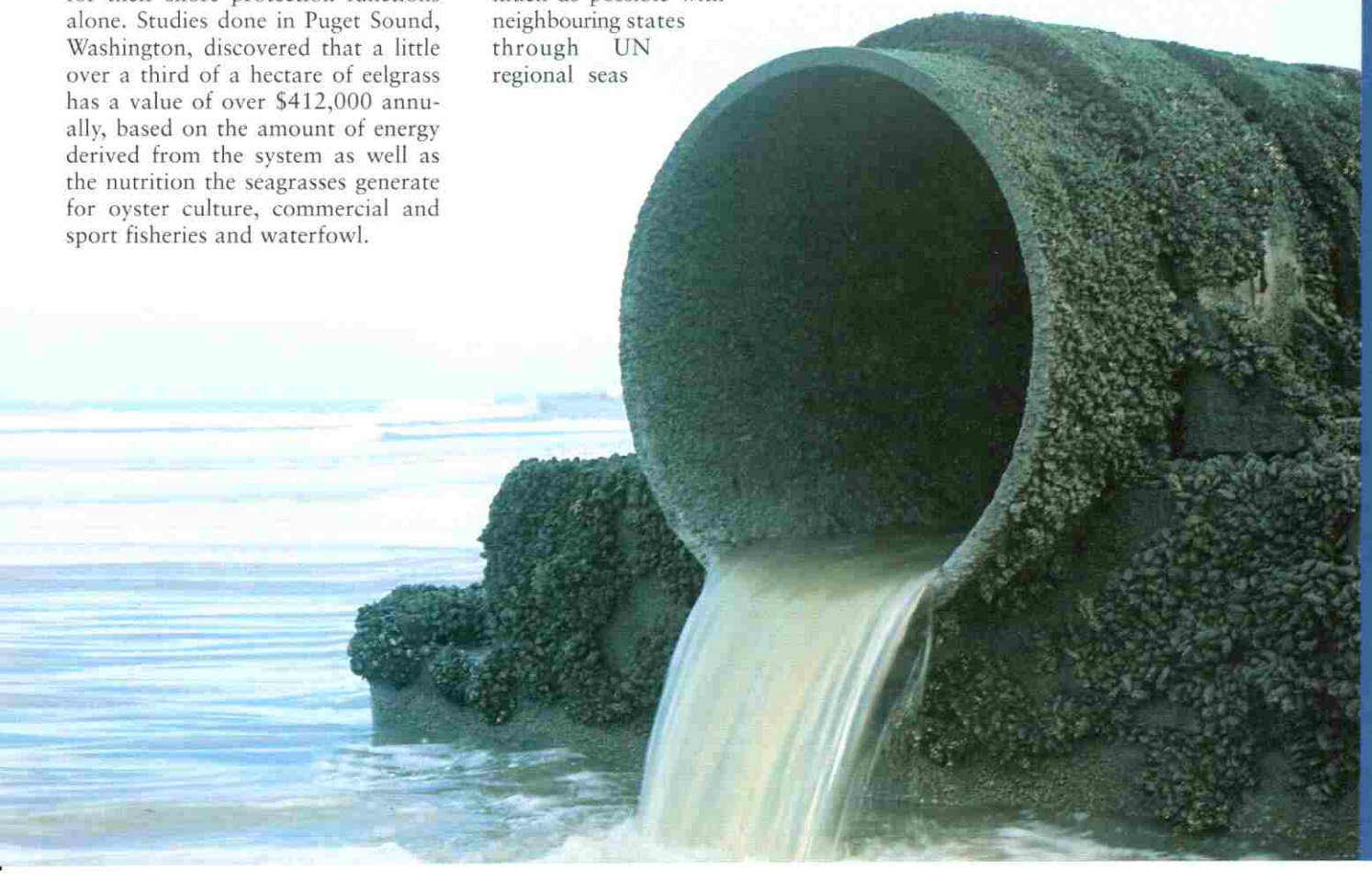
Similarly, there are other conventions on the books that deal with various aspects of ocean management and pollution prevention. The Oslo Dumping Convention and the London Dumping Convention, both endorsed in 1972, are examples. The only problem is, they are not being enforced rigorously enough.

In the final analysis, national governments must take the lead in managing their own waters on a sustainable basis, co-operating as much as possible with neighbouring states through UN regional seas initiatives and other international programmes. It is not too late to start preserving the ultimate source of all life on earth. But we must start soon. There is an immense task ahead and no time to waste in doing it. ■

Pierre Gleizes /The Environmental Picture Library

Don Hinrichsen is a Contributing Editor of *People & the Planet* and author of *Coastal Waters of the World* reviewed on page 28.

Far Left: Litter on beach, Venezuala
Above: Dumping industrial waste off the French Coast
Left: Offshore oil platform, Texas
Below: Sewage pouring into North Sea, UK



Renewing the w

During the past 100 years, ocean fisheries have been stretched to the limits, and the era of endless bounty is now over. The next century must be one of care and renewal as **Carl Safina** explains.

Michael Roggo/Still Pictures

On the twentieth century, ocean fish catches increased twenty-five fold, from 3 million metric tons to a peak of about 82 million metric tons in 1989. It declined the next year and has stagnated since despite increased fishing effort.

All major regions in the Atlantic, Mediterranean, and Pacific, have declining catches. In some regions, catches peaked in the early 1970s and have since declined by more than 50 per cent. In much of the rest of the world, catches peaked in the 1980s and have since declined by 10 to 30 per cent. Only in the Indian Ocean has the catch been increasing as the same industrialised fishing that depleted other oceans develops there.

Few believe the global catch can expand significantly. In 1995, the United Nations called fisheries "globally non-sustainable." They noted, "It is important to continue to single out overfishing (and its economic counterpart, over-investment) as the main culprit."

Meanwhile, some of the world's greatest "inexhaustible" fishing grounds and marine ecosystems – notably the Grand Banks and Georges Bank of Canada and New England – are now largely closed following their collapse. In Newfoundland, shutdowns have entailed a government bailout that will cost nearly two billion dollars. Conservation issues are often pitched as 'jobs versus the environment,' but in the oceans conservation can make jobs.

People generally forget that fish are wildlife. So instead of sensibly living off the biological interest of wild populations, we have been mining their capital. Ironically, over-emphasis on short-term economics has resulted in losses of billions of dollars to fishing businesses and taxpayers subsidising those losses. We have stretched the

orld's fisheries

Doug Perrine/Planet Earth Pictures

oceans to their limits, resulting in depletion, ecological upheaval, human impoverishment, and threat to the food supply for many poor people around the world.

Depending on fish

Fishing accounts for only about one per cent of the global economy. But on a regional basis, marine fishing contributes enormously to human survival. In Asia, more than one billion people rely on fish as their main source of animal protein. Worldwide, about 200 million people depend on fishing for their livelihoods, and fishing has been termed the "employer of last resort" in the developing world; an occupation when there are no other options.

Each year the number of people increases by an amount equal to the population of Mexico. Even if the fish that now go to fertilisers and animal feeds – a third of the catch – went to people, aquacultural production (seafood farming) will have to double in the next 15 years. Aquaculture has been growing rapidly enough to compensate for the decline of wild fish in commerce. However, since aquaculture requires property ownership and exports most of its expensive production to developed countries, increasing aquaculture may actually mean less food for truly hungry people.

Aquaculture faces challenges of its own. Half the people of the world live within about 60 miles of the coasts. This affects water quality. Worldwide mollusc production has already stagnated because of water quality problems. And many fish that cannot currently be bred are raised in captivity from wild fry which are getting scarce for some species because the wild fish are declining.

War on fish

Aquaculture does not appear likely to take much pressure off wild populations. In fact, some shrimp farmers are now fishing with fine-mesh nets to catch whatever they can to feed their shrimp. Aquaculture is likely to increase habitat losses and degradation. One major reason half the world's mangroves have been cut was to make artificial ponds to grow shrimp – for export to wealthy countries. Intensive aquaculture is in itself a source of pollution, releasing excess feed and faeces in semi-enclosed areas and creating over-nutrification and oxygen deficiencies in waterways. There have been problems with disease in dense, monoculture fish facilities adjacent to wild fish populations. Also problematic are the overuse of antibiotics which are toxic to some wild organisms. And alien species, including pathogens, have been introduced both intentionally and unintentionally during aquaculture activities, severely affecting some wild populations.

After World War II, fisheries adapted military detection technologies such as radar, sonar and loran to peaceful efforts of food gathering. But from the fishes' perspective it might have seemed that war was suddenly declared on them. Later

New stewards of the sea

The realpolitik of fisheries has long frustrated marine conservationists. All too often, short-sightedness has prevailed over scientific advice in setting catch limits, *writes Michael Sutton.* Now a new initiative pioneered by the World Wide Fund for Nature (WWF) and the Unilever food giant is working towards a radical reform of fisheries management.

The story begins in 1995 when WWF launched its Endangered Seas Campaign with the goal of reversing the effects of unsustainable fishing on marine fishes and the ocean ecosystems on which they depend. Coincidentally, Anglo-Dutch Unilever Corporation, one of the world's largest buyers of frozen fish, was beginning to worry about the future of its seafood subsidiaries.

Fortuitously, the two giants came together in early 1996 and announced a unique conservation partnership. They signed a statement of intent to establish a new organisation known as the Marine Stewardship Council (MSC) within two years. The idea was to create powerful market incentives for sustainable fishing by establishing a system of independent, voluntary assessment and certification of well-managed fisheries. Products from certified fisheries could then be marked with an eco label, assuring seafood consumers that the source of their fish was environment-friendly. For the first time, too, consumers would have a way of promoting responsible fishery management through their everyday purchasing decisions.

WWF and Unilever pledged matching funds to set up the new organisation, and hired a project manager to oversee the development of the MSC. Recognising that the success of their joint venture would depend on broad support, the partners embarked on a campaign to win support for their idea. A worldwide series of workshops helped persuade fishers, seafood processors, conservationists, scientists, government officials, consumer advocates, and others concerned with the future of fisheries that the MSC was a worthwhile approach. Meanwhile, WWF and Unilever convened a panel of experts to draft a set of principles for sustainable fishing that would ultimately underpin the certification process. Test cases were launched to see if fisheries certification was practical.

The results were astonishing, as if a tidal wave had hit the worldwide fishing industry. Trade organisations that had originally condemned the MSC and its founders began to take a fresh look, and some even published their own codes of practice. In early 1997, the MSC was formally established as an independent entity with offices in London. The new organisation was awarded charitable status later in the year, and took over from its founders the job of developing its infrastructure and principles. Dozens of stakeholders registered their support for the fledgling body, and fisheries around the world offered themselves up as test cases. With luck, the first products from certified fisheries will be available at the end of 1998.

Michael Sutton directs WWF's Endangered Seas Campaign.

came satellite maps of water temperature fronts, indicating where fish are congregating. Some satellites can now detect fish directly.

The arms of the fishing industry grew so full of new gadgets that they could not simultaneously embrace the concept of limits. Between 1970 and 1990, the world's fleet doubled. It now has twice the fishing power needed to catch what the oceans can produce. Consequently, fishing became an extremely inefficient venture, so bloated with excess killing capacity that $124 billion is spent to catch $70 billion worth of fish. Subsidies such as fuel tax exemptions, price controls, low interest loans, and outright grants for gear or infrastructure, plug most of the $54 billion deficit. The United Nations notes that current world fleet cost cannot be matched by revenues at any level of effort. This marginalisation of profitability increases political pressure to keep catches too high.

Subsidies often arise from governments' efforts to preserve employment, something that could be more easily achieved by directing investment away from industrialised, highly-mechanised ships and toward smaller boats. Per million dollars of investment, small-scale fisheries employ between 60 and 3,000 persons, while industrial-scale fishing operations employ one to five persons.

Bycatch and habitat

Fishes whose populations are at their historic low include some very familiar table fare: swordfish, several species of tunas, red snapper, northern cod, several types of flounders, many groupers, and others. But overfishing is not the only problem.

Each year the fishing boats of the world draw up an estimated 27 million metric tons of marine life – about one-quarter to one-third of total catch – which, dying or dead, are thrown overboard. Bycatch includes non-target fishes, juvenile target fishes, seabirds, marine mammals, and any other unintended creatures. Bycatch exceeds target catch in some fisheries. Shrimp trawlers' bycatch outweighs the shrimp themselves by 100 to over 800 per cent.

Waste is not the only issue; using everything would not solve the biological effects of catching large numbers of young fish, seabirds, sea turtles and mammals. Plucking hard on certain strings in the food web can cause vibrations in other creatures. In the Shetland Islands during the 1980s, terns, puffins, and other birds failed to breed when a fishery was developed to catch a small prey fish called the sand lance, upon which the birds relied heavily for food. In Kenya, fish that preyed on coral-eating urchins were depleted, allowing urchins to explode and damage the reefs.

In addition, fisheries suffer from habitat destruction and pollution. In many regions, bottom dwelling animals and plants (many of which feed and shelter fish) have been seriously damaged by commercial trawl fishing itself. Throughout the Indo-Pacific, many divers now catch reef fish for export to China by stunning them with cyanide, a potent poison which kills corals that are the fishes' habitats.

Habitats have also been degraded by

Shark shooters

Cage diving with great white sharks has recently become a popular offshoot of adventure tourism in South Africa's Western Cape province. But its very 'success' has encouraged new efforts to protect this and other marine species, *writes Caroline Wheal*.

Although there are sharks everywhere, a small channel between Dyer Island and Geyser Rock, just off the coast of Gansbaai, is the most heavily used area. Not only are great whites drawn there by the colony of Cape fur seals that inhabit Dyer Island, but the channel is sheltered from the prevailing southeast wind.

To attract sharks to their boats, scuba-dive operators start chumming – throwing a bloody, smelly mix of chopped-up fish into the water. When interested sharks arrive on the scene, eager divers (who have paid between R450 and R800, or £60 to £100) get into a cage and are lowered into the midst of the feeding predators. Sometimes there are as many as seven or eight boats jockeying for position.

Simply looking is often not enough. To make the experience even more of a thrill, some operators start tug-of-war matches with sharks that latch onto a bag of bait or seal carcass tied to the boat, trying to get the animal to rear its head out of the water. That classic shot of pointed snout and rows of fearsome teeth in an open mouth breaking the water is what operators say their clients want to see.

Dr Leo Campagno, who has worked at the South African Museum's Shark Research Centre since 1989, has mixed feelings about shark diving. "It makes the shark into something unreal," he says.

Dr Jeremy David, a senior scientist with the Department of Sea Fisheries who is chairing a working group on white shark cage diving believes that the next step will be to make chumming for great whites illegal without a permit.

A Department of Sea Fisheries' permit may not be the only one required in future. Cape Nature Conservation, the provincial environmental authority, wants to make the area within a 500-metre radius of the island into a marine reserve. It would then be able to limit the number of boats in the channel.

Dr Campagno supports the idea of controls. "Operators owe it to themselves and their customers to be regulated," he says. "The emphasis should be on protecting sharks and the people who see them."

• Unless governments agree to new limits on shark fishing, the species faces imminent commercial extinction said a recent TRAFFIC report released in collaboration with the WWF Endangered Species Campaign. Over the past two decades shark populations have declined by 80 per cent.

Caroline Wheal is *People & the Planet* correspondent in South Africa.

Keith Maywald / WWF

activities unrelated to fishing. Roughly two-thirds of commercially valuable fish spend their early life in shallow coastal waters, but half the world's estuarine saltmarshes have been destroyed. Destruction of half the world's coastal mangrove forests costs five million tons of annual fish catch – more than six per cent of the world total. Agriculture, road building, and deforestation cause extensive land erosion and sedimentation of coral reefs and streams, while water diversions and dams have destroyed many salmon and sturgeon populations.

Management problems

Few countries have achieved any success in fisheries management. In many regions, there are no data for management. Where data exists, policy-makers often ignore it. In many areas fisheries proceed unmonitored. Where management exists, managers often fail to anticipate new markets and new fishing methods, or, fishers break the rules.

The United Nations says that 70 per cent of the populations of fish, crustaceans, and molluscs in the world's oceans "are in need of urgent corrective conservation and management." Their main concern, at the global level, "is to control fishing effort and to reduce it where necessary." But between 1989 and 1992, the world added 136,000 fishing vessels. Correcting the situation will mean reductions in fishing, requiring controversial decisions, political will and enforcement – exactly the things most governments find difficult.

Toward saner seas

Solutions are available. One of the most important would be to remove subsidies that prop up fisheries that resources cannot support. There are promising new advances in bycatch reduction devices, and recoveries of some depleted species show that fish can come back. The problems are largely a matter of political will, but politics reflects public opinion, and that means politics can be changed.

The oceans remain the great frontiers of Earth, offering scientific mysteries and compelling opportunities in super-abundance. But the end of a long era of mythical limitlessness and ideological freedom in the seas is upon us. This may seem a tragedy of sorts, but coming to grips with reality is always liberating in the end. ■

Have the whales been saved?

The struggle to save the whales from the notorious over hunting by whalers of many nations, which reached its worst extent in the middle years of this century, has not yet been completely won, but there have been some major victories, *writes Cassandra Phillips*.

Virtually all species of the "great whales" were disastrously depleted during the last 300 years, some of them (such as blue whales, northern and southern right whales, humpbacks, bowheads and grey whales) to the brink of extinction, some less severely. Now, since the International Whaling Commission (IWC) protected the most endangered species, culminating in its moratorium on all commercial whaling (in force since 1986), there is encouraging evidence that some populations of some species (such as Eastern Pacific gray whales and Southern right whales) are beginning to recover, even though most are not expected to build up to their pre-whaling numbers in the foreseeable future. Some populations, such as Southern hemisphere blue whales and Northern right whales have apparently failed to start recovering despite over 30 years of protection.

In 1994, the IWC declared almost the whole of the Southern Ocean south of 40°S as a whale sanctuary. This, together with the previously agreed Indian Ocean Sanctuary, permanently protects approximately one third of the world's oceans from whaling. With the sanctuaries in place, large-scale whaling, with tens of thousands of whales being killed every year right up to the 1970s, is unlikely ever to be sanctioned in the future.

In spite of the moratorium and the Southern Ocean Sanctuary, commercial whaling on minke whales is in practice increasing quite fast. The two remaining whaling countries, Norway and Japan, are increasing the numbers of whales hunted each year by exploiting legal loopholes. Thus five years ago, in 1993, Norway killed 226 minke whales from the NE Atlantic under their formal Objection to the moratorium, and Japan 330 minkes from the Antarctic for "scientific research"; while in 1998 Norway is set to kill 671 and Japan 540, more than doubling the 1993 total. The IWC has been unable to prevent this escalation in commercial whaling in spite of passing Resolutions every year urging the whalers to respect the moratorium and the Sanctuary and to stop whaling.

In addition, the IWC still authorises what it labels "aboriginal/subsistence" whaling. A total of about 350 whales a year, of five different species, are hunted by mainly Arctic indigenous people for subsistence purposes.

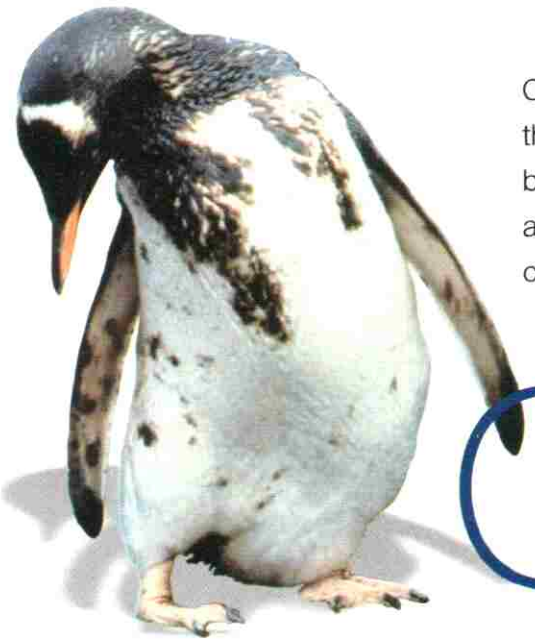
Meanwhile, even without whaling, all whales face other threats from human activities. During the past 25 years, the widespread use of driftnets and gillnets has caused the death of thousands, if not millions, of cetaceans. Other threats are ship collisions, global climate change, and chemical pollution. Evidence is now growing that the effects of industrial chemicals and pesticide run-offs on cetaceans are potentially the gravest threats to their survival. Even low levels of contaminants can increase susceptibility to disease and decrease fertility. If this continues, it is possible that some apparently stable populations of long-lived whales and dolphins could crash suddenly with little warning.

Cassandra Phillips is WWF International Treaties Co-ordinator (Whales, Antarctica, Wetlands).

J.D.Watt/WWF/Panda Photo

Carl Safina has been close to the sea all his life, as a fisherman, a seabird scientist and a voice for the restoration of abundance and vitality in the oceans. He is author of the new book *Song for the Blue Ocean*, published in January and reviewed in page 28. Dr Safina has served on the Mid-Atlantic Fisheries Management Council, the Smithsonian Institution's Ocean Planet advisory Board and the World Conservation Union's Shark Specialist Group. In 1990 he founded the Living Oceans Program at the National Audubon Society, and serves as Program Director. Dr Safina is a lecturer at Yale University and is a recipient of the Pew Charitable Trusts' Scholar Award in Conservation and Environment.

Above: Humpback whales at play
Opposite page: Classic shot that all Great White Shark safari tourists are chasing



Roger Grace/The Environmental Picture Library

Coastal seas and the wider ocean have become the sink for thousands of chemicals and heavy metals with widespread but uncertain impact on marine wildlife. Here, **Bruce McKay** and **Kieran Mulvaney** provide a fresh assessment of the causes, effects and future of marine pollution.

Cleaning

Around the world, some 70,000 substances are now in use as industrial compounds, cleaning agents, pesticides, fertilisers, pharmaceuticals, food additives and for other purposes. According to rough estimates by the US National Research Council, 1,000 new chemicals are introduced into the environment each year.

Global levels of other chemicals already in wide use are expected to increase; and while some contaminants are being phased out, their replacements are being found at environmentally-deleterious levels in various coastal regions.

Though rigid scientific proof is often lacking, organochlorines such as DDT, toxaphene and PCBs, polycyclic aromatic hydrocarbons, dioxins and furans, and organotins – all ubiquitous in marine environments – have been implicated in a tremendous variety and number of marine wildlife impacts, as have increased levels of many heavy metals.

A few examples include declines in the population of some European harbour seals due to PCBs; cancer and various chronic diseases in St. Lawrence beluga whales from a wide variety of contaminants; decline in Alaskan spectacled eiders (a sea duck) from lead poisoning; malformation, chromosome abnormalities and mortality of fish eggs and larvae in the mid-west Atlantic; increased numbers of mortalities in disease-related marine mammal die-offs, including Mediterranean striped dolphins and US coastal bottlenose dolphins. Also affected have been white tailed sea eagles along the Baltic Sea whose numbers have declined due to various organochlorines; Baltic Salmon which are thought to have developed M-74 disease syndrome at least in part, due to dioxins and the Hawaiian black-footed albatross which has been affected by PCBs, dioxins and furans.

Meanwhile, oil spills and chronic oil pollution – as much as 25 million barrels are estimated to enter the ocean each year – continue, for example, to kill many thousands of seabirds; one study estimated that more than 42,000 Magellanic penguins alone die from oil pollution annually along the Argentinean coast.

One of the most pressing threats to the integrity of coastal ecosystems is over-enrichment by nutrients, primarily nitrogen, from the run-off of agricultural fertilisers, emissions from fossil fuel combustion, various land-use changes, and from the discharge of human and animal wastes.

Robert Brook/The Environmental Picture Library

Many estuaries now receive over a thousand times more nutrients per unit surface area than heavily fertilised agricultural fields, thus making them the most heavily fertilised ecosystems on the planet.

Excess nutrients and changes in nutrient balances have led to the growing eutrophication of numerous coastal waters worldwide including, for example, Chesapake Bay, the northern Adriatic Sea, the North and Baltic Seas, and the Black Sea. The partial or complete removal of dissolved oxygen from the water column (anoxia/hypoxia), a consequence of eutrophication, has had a wide-ranging effect, including the mass mortality of benthic organisms, die-backs in seagrass meadows, and declines in biodiversity, and is considered to be an important contributory factor in the long-term decline of many coastal fisheries and to overall changes in the structure and function of estuarine and coastal environments.

In addition, the remarkable increase in the frequency, magnitude and geographic extent of algal blooms in numerous coastal environments, and the emergence of noxious and harmful species in unprecedented abundance, has in many cases coincided together with elevated nutrient inputs and eutrophication. One example is Hong Kong, where increases of sewage discharge and nutrient levels in local waters have been matched by the progressive increase in blooms in the region, from three in 1977 to 36 by mid-1988. The cause of recurrent, massive fish kills since the 1980s along the North Carolina coastal waters of the United States was traced to potent toxins from what was previously an unknown organism *Pfiesteria piscicida* which researchers suspect may have been stimulated into ecological prominence by elevated nutrient influxes from human sewage and hog farms.

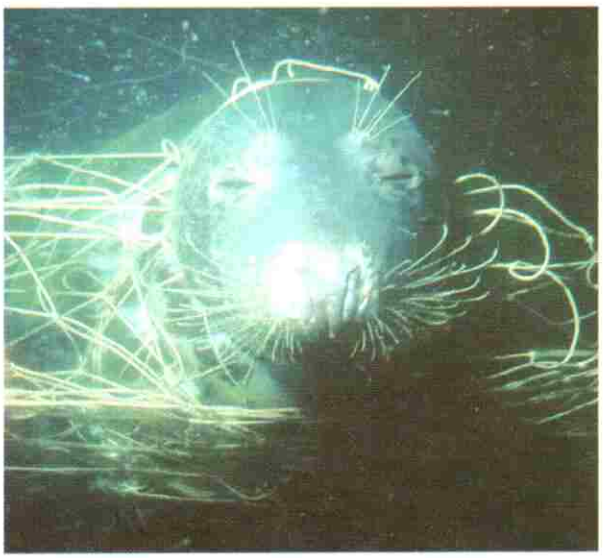
Any increase in harmful blooms or toxicity obviously increases the potential for their often disastrous effects including human illness and death, spectacular fish kills, closed shellfish beds, and severe economic loss. Recent mass mortalities of marine mammals and seabirds, including those that are endangered such as the West Indian manatee, humpback whale, Hawaiian monk seal, and brown pelican, have also been attributed to toxic algae, although the relationship of these events to human activity, if any, is unknown.

Indeed, much remains unknown or unproved. Determining cause-and-effect relationships involving a wide range of pollutants on the one hand and changes in species populations and ecosystem function on the other is confounded by the tremendous complexity and natural variability of marine environments and the effects of other, now global-scale, human impacts. Fisheries, altered freshwater influxes as a result of dams, the onslaught of introduced species, increased UV-B radiation, and coastal habitat

up the seas

Top left: Oiled gentoo penguin, South Georgia
Above: Chemical discharge into Mersey Estuary, England
Main Picture: Clean-up after Exxon Valdez oil spill, Alaska

Vanessa Vick/Science Photo Library



Gordon James/Planet Earth Pictures

Above: Seal caught in net

alteration and destruction, all exact tremendous environmental responses, themselves also poorly understood. Likewise, there is great uncertainty over the effects of climate change.

Virtually nothing is known about the vast majority of marine species; most have even yet to be described. And there is a paucity of historical data to serve as a comparative baseline between past, pristine conditions and those of the altered present. In the United States, information on chemical toxicities to support risk assessments is available for less than two per cent of all the chemicals in commercial use. Even less is known of the interactive or cumulative effects of complex suites of contaminants, the typical environmental scenario.

The known and suspected environmental and human health effects of contaminants, the many uncertainties associated with them, and dramatic environmental "surprises" such as endocrine disruption or ozone layer depletion, have prompted numerous calls for a precautionary approach in dealing with the natural environment. This radical yet common-sense perspective advocates the prevention of damage in the first place, action before scientific proof on deleterious effects is established, and the reversal of the burden of proof onto the potential industry or regulatory body to show that the product/activity will not have a negative environmental impact.

Progress in some areas is being made. For example, the Ministerial Declaration of the Fourth International Conference on the Protection of the North Sea in 1995 stated that the guiding principle would be a precautionary approach and that this implies "continually reducing discharges, emissions and losses of hazardous substances thereby moving toward the target of their cessation within one generation (25 years) with the ultimate aim of the concentration in the environment of near background values for naturally-occurring substances and close to zero concentrations for man-made synthetic substances."

Sustainability philosophies such as the 'Natural Step', gradually being applied in Sweden, or 'Clean Production' are being developed which move beyond the conceptual frameworks associated with chemical risk assessments, environmental assimilative capacity and pollution control. For example, Clean Production Action, a UK-based advisory group, promotes consumption and production directions that question the necessity of a specific product in the first place while taking into account its full life-cycle environmental impact and its social benefits and costs. Such an approach helpfully asks questions such as: will the product end up as marine debris?

Yet change will not come easily. Much of humanity has developed a profound dependency on nitrogen-based fertilisers, fossil fuels, pesticides, and a host of other environmentally damaging goods and services. The causes of marine environment pollution, as in other global change phenomena, are the result of a complex mix of historical, cultural and psychological, and economic and political parameters with decision-making often in the hands of people and organisations who know little about the issues or who stand to gain from inaction. As individuals, notably for those of us in the 'developed' world, it would seem necessary to continually strive to reduce our own ecological footprint while keeping alert for opportunities to promote public action. ■

Sea-based sources	Types
Dredging	resuspension of existing pollutants
Fisheries-related	nets and lines, packing bands, fish offal, operational oil discharges, anti-fouling paints
Mariculture	nutrients, organic materials, suspended solids, chemotherapeutants, biocides, anti-fouling agents, pathogens
Naval operations	hydrocarbons, plastic debris and garbage, anti-fouling paints, radionuclides (i.e., in sunken submarines)
Ocean dumping	sewage sludge, low level radioactive wastes, industrial wastes, munitions
Offshore oil and gas	hydrocarbons, heavy metals, phenols, drilling fluids
Oil spill clean-ups	surfactants, solvents
Recreational boating	plastic debris and garbage, fishing lines
Shipping (commercial)	oil and petro-chemicals etc. from spills and accidents, hydrocarbons, plastic debris and garbage, anti-fouling paints
Land-based sources	
Agriculture	nutrients (fertilisers), particulates, pesticides
Animal husbandry	nutrients, pathogens
Coastal development	debris and particulates, nutrients
Energy production	heavy metals, hydrocarbons, nitrogen oxides, radionuclides
Industry	synthetic chemicals, hydrocarbons, heavy metals, particulates, organic materials, nitrogen oxides
Landfills	heavy metals, hydrocarbons, nutrients, synthetic chemicals
Mining	heavy metals, nutrients (e.g., phosphate), processing wastes, radionuclides
Nuclear-related	radionuclides (from testing, reprocessing, accidents)
Pest control	herbicides, insecticides, larvicides, etc.
Ports/marinas	hydrocarbons, industrial chemicals (from spills), anti-fouling agents, debris
Sewage systems	hydrocarbons, nutrients, pathogens, industrial chemicals, particulates, organic materials
Urban runoff	debris and particulates, heavy metals, hydrocarbons
Vehicle emissions	nitrogen oxides, heavy metals
Waste incineration	heavy metals, hydrocarbons, industrial chemicals and by-products

Bruce McKay is the senior researcher for Sea Web: A Project of the Pew Charitable Trusts. Kieran Mulvaney is an environmental writer living in Washington. His book *Whaling Diaries* will be published later this year.

Turtle tales

Sea turtles have existed for over 100 million years and have outlived the dinosaurs. With the encroachment of tourism development and marine pollution, the very survival of these ancient sea-dwellers is now under threat. **Maya Pastakia** reports on one woman's effort to save the sea turtles.

One day in November 1996, a young Italian girl, Paola, having seen a TV programme on turtle conservation and the work of the Naples Institute of Zoological Research, Anton Dohrn, begged her restaurant-owner father to save a turtle caught in the nets of an Italian fishing boat that very same day.

After much pleading, the 15-year-old girl persuaded her father to take the turtle to the Institute instead of putting it on the menu. Under the care of Dr Flegra Bentivegna, the turtle nicknamed "Paola" in honour of its heroine, was nursed back to health. An operation was performed to remove a fish hook embedded in her throat.

Five months later, fit and well, Paola was ready to be returned home to her natural habitat, the sea. The Institute, interested in tracking the movements of sea turtles around the Mediterranean, fitted Paola with a satellite transmitter with the aim of tracking her for six to eight months. The Mediterranean Association to Save the Sea Turtles (MEDASSET) was called in to help organise her release. MEDASSET suggested releasing Paola from the Greek island of Kefalonia where many turtles nest in the summer and, importantly, where there is less driftnet fishing.

MEDASSET was founded in 1988 by Lily Venizelos, a committed environmentalist and nature lover. After picking up a magazine in a dentist's waiting room in 1983, she read that her favourite place, Laganas Bay – an area undergoing tourism development – was a crucial nesting area for loggerhead turtles. Lily realised that if development of beachfront hotels continued unabated, the survival of this endangered species would be under threat. Lily had found her mission in life: the sea turtles had to be saved.

Paola was given a royal send-off. Dignitaries of the island and representatives from the Italian embassy, a TV crew and a large local crowd bade farewell to her. Paola had now become a TV star.

For the next few months, Paola meandered her way south-east down the Peloponnese coast of Greece. Then on May 25, transmission ceased, just off Cape Tenaro, on the Mani Peninsula. At MEDASSET press releases were issued and port authorities and vessels alerted. Antenna TV broke the story on the news.

Incredibly, the first call was from a fisherman from Lavrio who reported catching a turtle in his nets off the Island of Kea in the Aegean, 190 kms from her last known position. "A turtle did get caught in my net as I was fishing in shallow water off Koundouros, Kea. I took it to the beach, cut my net to free it. It had a transmitter on its back. I thought it must be important, it was fit and healthy, and rushed down the beach back into the water."

The description of the tags seemed to match those of Paola. The next download from the satellite revealed that Paola had resumed transmission from precisely the place the fisherman released her. A sheet of black plastic which the fisherman disentangled from Paola's aerial had obstructed signalling.

The final transmission from Paola was in August 1997 indicating that she was safely swimming between the island of Lesbos (Greek-Aegean waters) and Dikili (mainland Turkey). The monitoring period has now expired.

Lily Venizelos is eager to point out that Paola is an extremely lucky turtle. Many sea turtles, marine life and seabirds face a less fortunate fate. Many turtles are killed by fishing nets, especially driftnets which entrap them and, unable to surface for air, they drown. Other hazards include the many varieties of marine pollution, most notably plastics and tar.

"Plastics are the scourge of our seas," says Lily. "They take over 450 years to degrade. The impact of small pieces of garbage, like foil sweet and cigarette wrappers, plastic bottle caps, straws, string and security tabs is catastrophic to marine wildlife when swallowed. A transparent plastic bag looks like jellyfish to a hungry turtle, her favourite food, by eating it she dies a slow painful death through blockage of her intestine, or by suffocation."

These beautiful, migratory reptiles face danger from the day they are born. Hatchlings being inexperienced feeders ingest plastic waste around them. They become so buoyant by consuming plastics that, unable to dive for food, they starve.

Unless efforts are made to protect these mysterious, ancient creatures their extinction is imminent. "It is time to stop selling sun and sand on the cheap. Out-of-control tourism disturbs and injures the turtles and prevents them from nesting and illegal driftnet fishing can needlessly kill and waste precious marine life," contends Lily. "The majority of countries bordering the Mediterranean sea are signatories to several international conventions protecting sea turtles and other marine life. As long as we continue to put pressure on governments to implement and give teeth to existing legislation and recommendations, we believe that there is still hope. Species extinction is the greatest the world has experienced for the past 65 million years. Unlike most other ecological problems it is totally irreversible. We must all work together to preserve the planet's biodiversity which we ourselves depend on for our own survival." ■

Lily Venizelos joined UNEP's Global-500 roll of honour in 1987 for her efforts to save the turtles.

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A new web site entitled *EuroTurtle* providing scientific information and educational initiatives to save the Mediterranean sea turtles can be accessed at these sites:
http://www.exeter.ac.uk/MEDASSET
http://www.exeter.ac.uk/telematics/EuroTurtle

Costas Papaconstantinou/MEDASSET

Despite new estimates of expected sea level rise, small island nations and deltas are still under threat. **John Pernetta** reports on the latest evidence.

Truchet-UNEP/Still Pictures

Rising seas and changing currents

During the mid-1980s when estimates of global mean sea level rise as a result of climate change were in excess of one metre by the middle of the next century, great concern was expressed by leaders of the small island states and low lying coastal countries concerning the potentially devastating impacts that might result. As scientists have refined those estimates, the magnitude of the anticipated sea level rise has declined, and so apparently has international interest and concern.

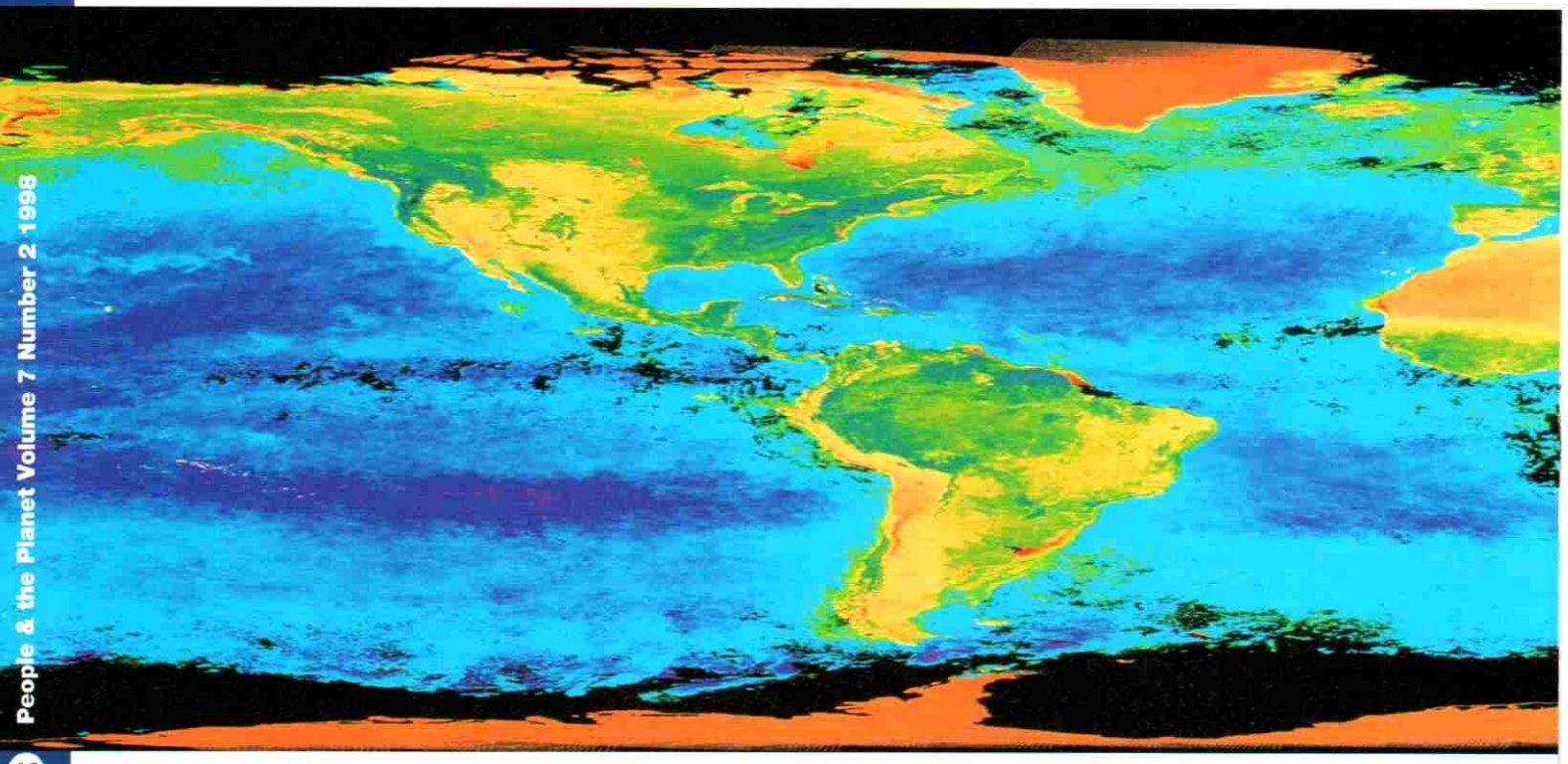
The present estimates of a rise in global mean sea level of around 5 mm per year nevertheless represent a significant threat to low-lying states composed of atoll islands such as the Maldives, the Marshall Islands, Kiribati and others in the Caribbean, Pacific and Indian Oceans. It has been estimated for example that of the total land area of the Maldives (398 square kilometres) some 65 per cent is less than one metre above present sea level. The rate at which such islands can accrete vertically through natural production and accumulation of coral sand is unknown and thus the ultimate fate of these islands cannot be predicted.

What is clear however is that islands such as Male, the capital of the Maldives, which have undergone extensive development, including the construction of sea walls and armouring of the shore-line, cannot grow upwards naturally. Such islands lie on top of porous limestones, thus as the sea rises outside the walls it also rises inside, restricting the depth of the freshwater lens that represents the major source of potable freshwater for the human population. As sea level rises sea walls will need to be raised and pumping installed to maintain a dry land surface. The recurrent costs of pumping, using imported fossil fuels will be beyond the capacity of the nation to support, and there is a need therefore to examine the feasibility of using alternative and renewable energy sources such as solar, wind and biogass.

While many atolls rest on solid geological foundations and the rates of geological subsidence are low, low-lying coastal areas, particularly those occurring in the major delta's of the world, face added problems. The relative rate of sea level rise in these areas is much greater than the rate of global mean sea level rise due to the added problems of a sinking land surface. The land may be sinking naturally due to subsidence of the underlying strata and compaction of the softer sediments above, but natural subsidence is greatly increased in areas such as Bangkok where groundwater is extracted for human use. In addition the major rivers that under natural conditions provided annual inputs of sediments to the delta, thus raising the land surface, have been dammed or their channels canalised so that additions of silt to the land surface no longer occur, or occur only in greatly reduced quantities.

Such problems are not insurmountable as shown by the Netherlands where much of the land surface lies below present sea-level and a dry land surface is maintained by means of protective dikes and sea walls and continuous pumping out of excess water. But the costs of such a response to rising sea level can be met only in wealthier nations. For poorer developing countries such as Bangladesh the costs would be prohibitive.

The time lags between increasing greenhouse gas concentrations in the atmosphere, rising temperatures and expansion of the sea surface waters causing increasing mean sea levels are long. Even if greenhouse gas



concentrations in the atmosphere are stabilised, the problems of sea level rise will continue for many decades, and continued rapid development of coastal areas will enhance their vulnerability in the longer term.

More sustainable patterns of coastal and island development are needed if the economic costs of the responses are to be kept within the bounds of the possible.

Ocean conveyor

The future impact of global warming on ocean currents provides another conundrum for scientists and policy-makers.

Due to its great capacity for storing energy and its relatively slow response to rising global atmospheric temperatures the ocean has been described as the flywheel of the Earth's climate system. Transporting heat energy from the tropics and releasing it to the atmosphere at higher latitudes the ocean moderates the climate of continental areas at higher latitudes. Changes in density of the sea surface waters resulting from heating and cooling, freshwater inputs and evaporation that alter the salt concentration result in cold, dense water sinking in the North Atlantic and flowing as deep water southwards.

The Great Ocean Conveyor belt moves water between the ocean basins over thousands of years and while this pattern of circulation is unlikely to be changed by rising atmospheric temperatures it could be changed if the freshwater run-off from the land surface changes markedly with climate change. In contrast to the deeper ocean waters the circulation and movement of surface waters responds more rapidly to changes in atmospheric temperature and circulation.

And, as we know, alterations in the strength and direction of flow within such surface systems can affect nutrient upwelling, plankton production and fish stocks. This is well illustrated in the El Niño Southern Oscillation.

During strong El Niño events the upwelling of nutrient-rich deep ocean water off the Pacific coast of Latin America is suppressed with resultant reduction in phytoplankton productivity and collapse of the pelagic (open sea) anchovetta fishery. Not only does this have severe economic impacts but other species dependent on this productive pelagic system suffer starvation and high mortality rates.

During the 1972-73 and 1982-83 El Niño events, the catch of anchovetta fell to one sixth and one six hundredth of their normal levels. Following the 1972-73 event the populations of cormorants, boobies and brown pelicans fell to around 6 million birds from approximately 30 million in 1950 and following the 1982 event a further decline reduced their numbers to around 300,000.

Similar inter-annual variations in current patterns in the Northwest Pacific also result in inter-annual variability in the Japanese catch of sardine. Not only would a permanent change in surface ocean currents impact fish stocks in this way but changes in water temperatures and currents will affect the distribution and stocks of demerol in-shore fish and other species. During the 1982-83 El Niño, for example, water temperatures around 1.5°C higher than normal bleached and killed large areas of coral around the Gorgona Islands of Panama. Elsewhere, off Peru, the warmer conditions led to a ten-fold increase in lorna fish.

While the overall productivity of the oceans and the global total harvest of marine species are unlikely to change under conditions of climate change and changing current patterns, the distribution of the stocks and the relative importance of different species is likely to alter, with consequent economic impacts on the fisheries and countries that depend upon these resources.

Enhancing our capacity to understand, model and predict inter-annual variability in oceanic conditions and its consequences for marine biodiversity and fisheries production thus has a strong economic justification. ■

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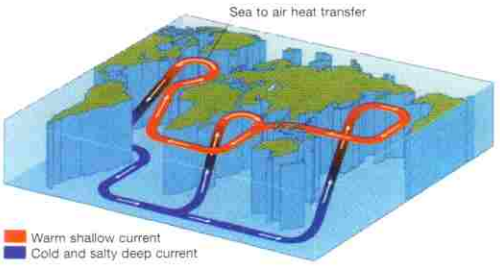
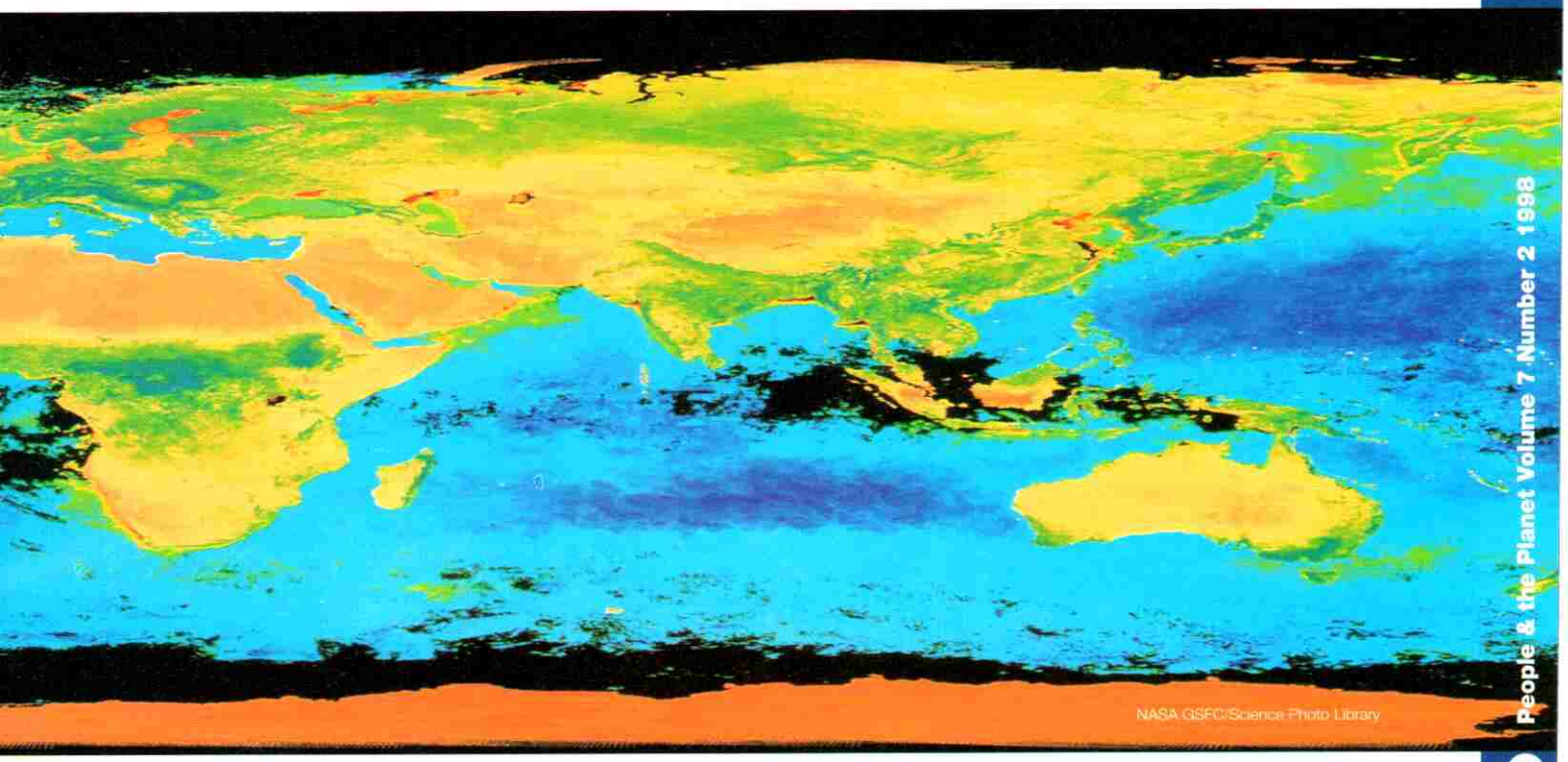
The opinions expressed in this article are those of the author and do not necessarily represent those of either UNEP or the Global Environment Facility.

Top left: Pacific Islands are under threat from sea rise
Below: Diagram showing the system of world currents
Main Picture: Satellite image of Earth's biosphere showing the distribution of vegetation on land and phytoplankton in the oceans. Areas of purple in the ocean indicate where plankton is least dense





"I knew that I should never again look upon the stars without remembering their active, living counterparts swimming about in that terrific pressure...this strange world...When once it has been seen, it will remain forever the most vivid memory in life, solely because of its cosmic chill and isolation, the eternal and absolute darkness and the indescribable beauty of its inhabitants."

William Beebe, Half Mile Down

Secret treasures from the deep

Now is the time to uncover the mysteries of the ocean deep – the largest habitat on earth – says **Sylvia Earle**, internationally-renowned scientist and author.

Half a century ago, the deep sea was thought to be as remote and inaccessible as the far side of the moon. According to international law, the seabed below a few thousand feet was known as *res nullius* – incapable of occupation, a no-man's land.

Curiously, despite the enormous technological advances in recent years that have taken humankind to the moon, planted instruments on Mars and lofted sensors far beyond our own solar system, the deep sea remains largely unknown, unexplored, and generally inaccessible. Despite impressive discoveries and greatly improved mapping techniques in recent years, less than one per cent of the deep sea actually has been seen, let alone explored.

The difficulty of gaining knowledge of the deep sea is conveyed by Willard Bascom's description of a special place in the South Pacific:

"The Tonga Trench is 15 to 30 miles wide and 7 miles deep...A mile deeper than Everest is high. As deep as seven Grand Canyons but with much steeper sides. Higher than a stack of 30 Empire State Buildings."

To sample this heroic crack, Bascom lowered a tube six feet long, weighted with lead – a gravity corer – over the side of a research ship. Hours of effort yielded one small chip of basalt.

Descending into the sea, twice atmospheric pressure – 29.4 pounds per square inch (psi) is reached at 33 feet. At 3,028 feet, about half a mile – a depth first attained in the 1930's by zoologist William Beebe and engineer Otis Barton in a small bathysphere – the pressure is 1,360 psi. During a single dive, sperm whales dive to as much as a mile beneath the surface and in so doing, experience a range of pressure from a few pounds to more than one ton on each square inch of their big bodies. At seven miles, the deepest sea, the pressure is about 16,000 psi.

Building systems to withstand such pressures presents formidable challenges, but the technology and engineering skills exist to master the problems. Ironically, a successful roundtrip journey was made many years ago, in 1960, when US Navy Lieutenant Don Walsh and Swiss engineer, Jacques Piccard, travelled in the bathyscaphe, *Trieste*, to the bottom of the deepest place in the ocean, the Challenger Deep in the Mariana Trench, 35,800 feet down. They remained there for about half an hour.

Flip Schulke/Planet Earth Pictures

Not until 1996 was there an attempt to return, remotely, with a large robotic vehicle, *Kaiko*, designed and operated by the Japanese research institution, JAMSTEC. Images relayed from cameras on the vehicle back to the surface revealed planktonic creatures throughout the water column and a diverse assortment of life on the sea floor – sea cucumbers, brittlestars, small translucent shrimp, fish, molluscs and much more. *Kaiko* is a wonderfully capable machine, but sadly, no nation now has the capability of delivering people seven miles down – and returning them safely to the surface.

Why bother?

Sceptics may ask, why bother to go at all?

Mountain climbers justify their passion for ascending to the highest places above sea level, the top of Mount Everest, with a simple "because it's there". For some, the same rationale may work for the deep sea.

Others have found down-to-earth practical motives in the need to retrieve things lost in the sea – search, salvage and especially submarine rescue. In the 1960's, the loss in deep water of US Navy submarines *Thresher* and later, *Scorpion*, provoked intense interest in deep-diving capability. The loss of a live hydrogen bomb in more than 1,000 feet of water off the coast of Palomares, Spain, was a not-so-gentle "wake-up call" highlighting the importance of deep ocean access.

In the decade of the 1960's, another dramatic event fired interest in going deep. In a highly secret project involving the use of a large ship, *Glomar Explorer*, parts of a Soviet submarine were recovered – under the guise of a deep sea mining operation. Prior to that time, it was known that in some parts of the deep sea, potato-sized nodules rich in iron, manganese, copper and other metals were extremely abundant, but recovery seemed hopelessly impractical. The apparent interest of a large commercial firm in mining the nodules sparked considerable activity among many companies that did not want to miss out on what appeared to be a realistic and possibly lucrative enterprise.

Rich deposits

In 1970, drafters of the United Nations Law of the Sea Treaty proposed that the deep sea bed in the areas beyond national jurisdiction – then typically three to twelve miles – be held in trust by the United Nations as the "Common Heritage of Mankind", and that its resources be developed by a United Nations enterprise. The plan was not acceptable to many nations, but a compromise was reached with respect to deep sea mining, with certain concessions to nations that had already made an investment in exploration.

In the years that followed, as nations claimed the area offshore to 200 miles to be their Exclusive Economic Zone (EEZ), deep water areas became part of the equation for many, especially certain small island nations. Within 200 miles of the Cook Islands in the South Pacific, for example, there are hundreds of square miles of ocean bottom in 15,000 to 20,000 feet of water and on their muddy surface rests some of the most dense accumulations of manganese nodules known.

Since then, interest in deep sea mining has waxed and waned repeatedly, largely linked to economic feasibility – or lack of it. Attention has also extended to the potential for mining crusts of metal-bearing ores created in association with hydrothermal vents and hot seeps in the deep sea. Discovery of rich deposits in deep water within the EEZ of Papua New Guinea has attracted commercial mining operations, and other areas are being targeted for exploitation.

Among the most compelling economic reasons for gaining access to the deep sea is that offshore oil and gas extraction has been moving steadily deeper. Once limited to a few hundred feet, operations are now underway in thousands of feet underwater, far offshore, using sophisticated systems that rival technology developed for living and working in space.

New kingdom

New technology has also provided effective ways to find and extract wildlife from the sea. Acoustic techniques developed to identify and track submarines have been adapted to detect aggregations of fish that have heretofore escaped notice, and new lightweight, strong, and durable materials for nets facilitate their capture – even in thousands of feet of water.

The consequences of exploiting remote parts of the ocean, either for living resources or for minerals, before these areas have been explored, before their overall significance to planetary functions has been considered, is beginning to arouse concern. Sizing up the assets, whether for environmental or economic values, has become an increasingly compelling reason to explore the deep sea.

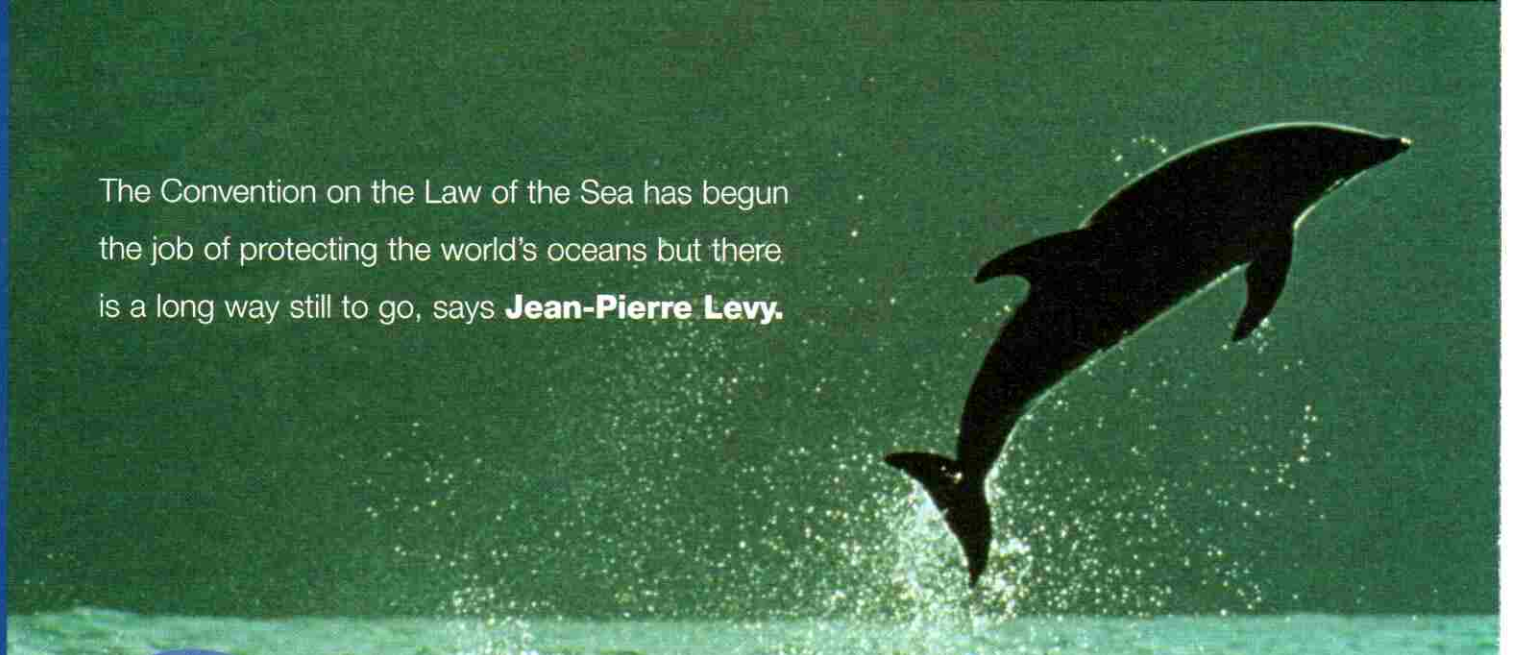
Most of what is known about the ocean has been learned since Beebe and Barton first glimpsed creatures living half a mile underwater, half a century ago. Coincident with the development of technology for effective access to the depths, revolutionary new insights have been achieved concerning the existence of entire sub-sea mountain ranges, of global processes involving the motion of continents and of the deep sea floor. Just as revolutionary have been biological discoveries – previously unknown communities with a lifestyle based on chemosynthesis, an awakening awareness of the enormous diversity of life throughout all of the sea, the discovery of a new kingdom of microbes that provides clues concerning the origin of life itself – and much more.

Largest habitat

Meanwhile, vast perturbations, caused by increasing human disruption to natural systems worldwide, have given a sense of urgency to an already lively interest in planetary processes. There is a growing awareness of the need to understand how the Earth's overall physical, chemical and biological systems interact. It seems reasonable that exploration of deep sea – the largest habitat on Earth – should be taken into account as a natural extension of the rest of the planet. This is the time to "put it all together", with nothing less than the future of mankind at stake. ■

Dr Sylvia A. Earle is an oceanographer and founder of Deep Ocean Exploration Research (DOER) in 1992. She holds numerous awards and honours for her work in marine science and conservation, including the 1997 Bal de la Mer Foundation's Sea Keeper Award. Dr Earle has led more than 50 underwater expeditions and holds a depth record for solo diving (1,000 metres). She is also author of numerous publications concerning marine science, including *Sea Change* (published by Constable, London,1995, £18.95).

Kelvin Aitkin/Still Pictures



The Convention on the Law of the Sea has begun the job of protecting the world's oceans but there is a long way still to go, says **Jean-Pierre Levy.**

Caretakers

"A constitution for the Oceans, the most important agreement among Nations since the adoption of the Charter of the United Nations." Thus was the adoption of the Convention on the Law of the Sea hailed in 1982. After a fundamental change in one of its components dealing with the deep seabed and its resources, the Convention entered into force on 16 November 1994. It is now strongly supported by almost all States of the world, including all the major maritime powers.

So how is it working? Is this set of rules usefully regulating the use of ocean resources and the preservation of the marine environment for future generations? Or Not?

The Convention is predicated on the premise that "the problems of ocean space are closely interrelated and need to be considered as a whole". Consequently, it tries to regulate all activities of States in the marine environment, whether it be the exercise of sovereignty, navigation, exploitation of resources, conduct of scientific research, preservation of the environment, development and transfer of technology, or settlement of disputes.

In reality, the new Law of the Sea has successfully solved a number of difficult issues relating to the exercise by States of their jurisdiction over ocean space and its resources, but it does not provide answers to all of them.

Limits at sea

Among its major achievements are the adoption of clear limits of jurisdiction of coastal States over ocean areas and the concomitant rules of navigation, the basic guidelines for the use of ocean resources and the creation of institutions in particular for the peaceful settlement of disputes.

After centuries of divergent practices, at last all coastal States have agreed to adopt a uniform limit for an adjacent belt of sea over which they have complete sovereignty. The maximum breadth of their territorial sea is now fixed at 12 nautical miles. In this zone, all foreign ships have a right of innocent passage which means that they are only allowed to traverse that sea and that submarines are required to navigate on the surface.

As this provision has placed under national sovereignty more than 100 straits used for international navigation, a new regime of transit passage has been adopted which allows for freedom of navigation through these straits including the right of submarines to navigate submerged.

Beyond a territorial sea, whenever possible, States can declare an exclusive economic zone which should not extend beyond 200 miles. In this zone, while complete freedom of navigation is maintained, coastal States have sovereign rights over living and non-living resources and some additional rights as well as some specific duties.

Beyond these zones the high seas start where all states enjoy the traditional "freedom of the seas". Over their continental shelf which is the natural prolongation of land territory under the sea either arbitrarily fixed at 200 miles (in the absence of a shelf) or extending up to the limit of the continental margin with a maximum of 350 miles, they have sovereign rights to exploit the mineral resources and sedentary living resources.

As far as the deep seabed beyond the limits of national jurisdiction is concerned, it has been declared a "common heritage of mankind" and its resources will have to be exploited under the control of the International Seabed Authority established in Jamaica.

Ocean resources

A number of provisions of the new Law deal with the resources of the ocean, in particular with fisheries in the Exclusive Economic Zone, where some 90 per cent of the resources are to be found. The initial provisions of the Convention dealing with straddling stocks and highly migratory stocks were found insufficient in the light of the collapse of a number of fisheries around the world.

A new agreement was agreed in 1995 which should go a long way toward rational use and management of fish stocks also to be found in the high seas, providing it is implemented by all concerned in good faith.

Institutions

When the Convention came into force in 1994, three institutions were created.

The Commission on the Limits of the Continental Shelf was set up to consider the information submitted by coastal states concerning the outer limits of their continental shelf in areas where it extends beyond 200

Main picture: Dusky dolphin, Kaikoura, New Zealand
Below: Fishermen, San Pedro, Belize

of the sea

miles. Once the Commission has pronounced, the limits established by the coastal state on the basis of this recommendation shall be final, and will determine the extent of the international seabed area.

The International Seabed Authority, established in Kingston Jamaica will control activities in this area. Initially conceived with quasi supra-national powers the provisions relating to its functions and management were not acceptable to most industrial powers including the United States, the United Kingdom and the Federal Republic of Germany which refused to sign the Convention for this reason. An agreement adopted on 28 July 1994 removed from the initial text all the provisions unacceptable to the major industrialised powers and thus paved the way to the universal acceptance of the Convention. However the Authority remains a potential for the future.

The International Tribunal for the Law of the Sea established in Hamburg, Germany was created specifically to become the major judicial body to handle disputes relating to ocean affairs. It has established special chambers, including a Seabed Dispute chamber where not only States but also the Authority as well as natural and juridical persons can appear. The Tribunal is expected to play a major role in the development of a body of jurisprudence.

Unfinished agenda

Besides these major achievements, the Convention contains provisions which are either too general or too limited in their scope to solve some present and foreseeable problems. Some of these weakness were identified by the Independent World Commission on the Oceans which is due to report this year. These weaknesses relate essentially to the question of peace and security, the use of the high seas and the protection of the environment.

Despite the frequent reference to "peaceful uses of the sea" in the Convention, no substantive content is given to this expression. Nowadays, peace and security is understood as going much beyond the absence of military hostilities to problems of food, environment, terrorism, drug trafficking and piracy. There is an urgent need to adopt new and forceful measures to effectively ensure peace and security in the oceans.

It also seems timely to revisit the traditional concept of "freedom of the high seas" in view of the increasing threats posed by various abuses including overfishing and environmental degradation, including dumping. It is proposed to consider the High Seas as a public trust where the States are to act as trustees and the beneficiaries are the people of the world.

Marine environment

Finally, it is in the field of the preservation of the marine environment that the greatest effort has to be made.

The Convention on the Law of the Sea has established a general framework requesting States to adopt laws, regulations and standards to prevent, reduce and control pollution from all possible sources: from land-based, sea-bed activities, dumping, vessels sources and the atmosphere.

It is now up to responsible States to translate these general injunctions into detailed rules. In some cases, the adoption of new Conventions such as that on Climate Change or on Biological Diversity will have a positive impact. Similarly the Plan of Action concerning land-based sources of pollution is promising, as almost 80 per cent of the pollution of the sea stems from land sources.

However, more than conventions and plans of action are needed. The future of the ocean needs a greater understanding of its importance for the survival of humankind and a general mobilisation of all energies at the individual as well as collective level. International law and the behaviour of States are ultimately responsive to people's pressure.

Let us create such a pressure. ■

Dr Jean-Pierre Levy is former Director of the Division of Oceans Affairs and the Law of the Sea, United Nations and is Executive Secretary of the Independent World Commission on the Oceans.

Tony Rath/WWF

Mark Carwardine/Still Pictures

Conservation efforts for oceans and coasts have lagged behind those for the terrestrial environment. But there is at last a significant reaction to the pending ocean crisis, symbolised by the designation of 1998 as the International Year of the Ocean. **Sue Wells** reports on some recent efforts to manage the oceans.

A tide of change

Marine resource management earlier this century used essentially a species-by-species approach: cod, haddock, turtles, whales. As other articles in this issue have shown, the species approach to fisheries management has largely failed, although for larger, rarer species with particular conservation needs, such as turtles and whales, it has been more successful.

However, increasingly it became clear that protection of critical habitats was equally important for the survival of threatened marine species and for maintenance of healthy fishery stocks. This realisation has resulted in the establishment of marine protected areas, ranging from small, highly regulated reserves to protect threatened species and marine biodiversity (such as marine reserves in the United Kingdom), to larger, zoned, multiple-use parks where recreation and limited fishing are permitted in certain areas (such as the Great Barrier Reef Marine Park in Australia).

As marine protected areas have steadily increased in number (there are now about 1,000), so the difficulty of managing them effectively has become more apparent. There is frequently a conflict between the different users of an area, such as fishermen and divers, well illustrated in the case of Florida's Marine Sanctuary. Furthermore, protected areas often have a 'honey-pot' effect, attracting hundreds of visitors with the promise of pristine habitats and diverse wildlife – a situation seen nowhere more clearly than in the Galapagos.

Equally importantly, and even more difficult to tackle, are the activities taking place outside the protected area that cause pollution, siltation and depletion of species populations, and which may make meaningless any work put into managing visitors, installing mooring buoys, or regulating fishing within the area.

Ocean and coastal management must therefore be looked at in the broadest possible sense. Fisheries management must take into account all the parameters on which a fishery stock depends (spawning, nursery, feeding areas, as well as interactions with other species such as prey). In coastal waters, 'integrated coastal management', which means managing the coastal zone and its watershed as a single unit, is now widely recognised as more appropriate approach, although it is difficult to implement and there are few successful case studies.

Within this broader framework, marine protected areas are still essential to protect critical habitats and threatened species, but equal emphasis is put on a whole range of management issues such as land use planning, pollution control, and environmentally sound agricultural and building practices. To achieve successful integration, all those responsible for these activities, including government agencies, business and industry, farmers, fishers and local people, need to be able to share their concerns and jointly develop solutions.

The evolution of such management approaches can be seen in many places, such as Turkey, where WWF and the National Society for the Protection of Nature (DHKD) have been working since 1988 to protect the few remaining nesting sites in the Mediterranean of the endangered loggerhead and green sea turtles.

The first success was to halt a huge tourist development complex at Dalyan, one of the main nesting sites. This area and three other important nesting beaches were subsequently declared protected areas. However, tourism, as a vital economic activity in the area, has continued to grow and so WWF and DHKD are helping to develop a comprehensive management plan for the Belek coast, covering economic and social issues and involving local people.

Similar integrated planning approaches may be needed for the high seas and deep oceans. Here we lag even further behind management of coastal waters, lacking even the legal infrastructure to establish protected areas (other than whale sanctuaries) on the high seas. With increasing exploration, and now exploitation, of these areas for oil, gas, minerals and pelagic fishery stocks, this will become a pressing concern in the next century.

Our long-cherished concept of the 'freedom of the seas' has now been challenged, and we will probably have to recognise that it is a thing of the past, at least with respect to marine resources.

We can however learn from places where the marine environment and its resources have been accorded greater respect. Centuries back, in many parts of the Pacific, coastal communities evolved systems by which they regulated their use of marine resources through tenure systems and customary rights, often handed down through families and lineages. These systems have been eroded but are now being resuscitated and often given official recognition, as we come to realise that those who use the marine environment must be involved with, have some control over, and take some responsibility for its management.

Where such traditions do not exist, the models they provide can nevertheless be used, as in the Banc d'Arguin National Park in Mauritania, where the Imraguen fishers have been given fishing rights within the park. Many fishing and coastal communities are now playing key roles in the management of the world's oceans and coasts.

If governments and nations recognise their own roles, change current detrimental policies and make wise decisions on marine resource management, there is hope for the future. ■

Sue Wells is Marine Programme Co-ordinator at WWF International.

Florida Keys National Marine Sanctuary, a 2,700 square mile region encompassing all of the Florida Keys was formally established by the US Congress in 1990. Efforts since then to preserve this unique ecosystem have raised fundamental issues central to the future of marine parks in the United States. **John Ogden** reports.

A sanctuary for life in Florida's seas

The environment of Florida Keys has long been regarded with alarm, with precipitous declines in coral cover, declining water quality, and increasing blooms of benthic and planktonic algae heading a long list of problems.

In 1991 a major planning process was begun by the National Oceanic and Atmospheric Administration (NOAA), centring on the Sanctuary Advisory Council (SAC), a broadly representative group of local stakeholders, supported by an inter-agency group of Federal, State, and local agencies. After six years' of work, the Governor of Florida signed a co-operative agreement with NOAA to manage state waters (from the shoreline to three miles) under the Sanctuary Management Plan. It finally came into force in July 1997.

The Plan consists of 10 action areas including channel marking, education, enforcement, mooring buoy, regulatory, research and monitoring, submerged cultural resources, volunteers, water quality, and zoning. Water quality and zoning have caused the most public controversy.

Water quality

The plan uniquely recognises that careless use of the landscape and sewage disposal are major causes of declining water quality. It has changed formerly 'gin clear' coastal waters to ones clouded by plankton blooms and sediments which can kill organisms such as corals which require clear, clean waters to thrive.

Upstream of the Sanctuary, 50 years of water management displaced the natural rainfall-driven flows of freshwater from their ancient drainage channels in the Everglades east to the Atlantic to prevent flooding in urban and agricultural areas. Downstream in Florida Bay, the lack of freshwater runoff changed the normal seasonal cycle of high and low salinity in dry and wet periods to persistent high salinities. This has been implicated in the massive die-back of seagrasses which began in Florida Bay in 1987 and which continues today with cascading impacts farther downstream in the Sanctuary, including sponge mortalities, declines in the recreational fishery, and coral mortality.

One of the key features of the comprehensive water management plan is to link water quality in the Sanctuary to the health of Florida Bay and the Everglades. This link stimulated the formation of the Everglades Restoration Task Force which is committed to a multi-year, multi-billion dollar project to restore the quality, quantity, and distribution of freshwater flows from the Everglades into the Bay.

Marine reserves

Following the success of the zoning plan of the Great Barrier Reef Marine Park in Australia, the Sanctuary's management plan uses ocean zoning to separate four potentially conflicting human uses: wildlife management areas, sanctuary preservation areas, special use areas, and marine reserves.

Of these, the 'no-take' marine reserves proved to be the most controversial for their relatively large size, the economic and social impact of no permitted fishing, and for the lack of conclusive scientific data showing that they will work. Through concerted political action, the five marine reserves, set at approximately 20 per cent of the Sanctuary in early drafts of the plan were cut to three marine reserves forming 10 per cent of the Sanctuary area, then to three reserves at 5 per cent, and finally to one marine reserve at 0.05 per cent of the Sanctuary area.

Reserves are the only effective tool that fishers, managers, and scientists have to gather baseline data from undisturbed areas so the impact of fishing and disturbance in the rest of the Sanctuary can be assessed. Coral reefs are particularly sensitive to the removal of the large sized fish, such as predatory snappers and groupers, as well as plant-eating parrotfishes which disrupts the balance of the reef and leads to dominance by algae. This condition is now seen in many parts of the Keys.

A research programme, began last year, centring on the one remaining reserve in the Sanctuary, indicates that it should be possible to build populations of larger size classes of fishes, lobsters, and conchs within three years. These larger organisms will attract people who expect to have undisturbed areas to visit within the large area zoned for many uses. A large grouper is more valuable being seen by snorkelers than it is on a fishing line. We also expect that the reproductive output of organisms within the reserve will help to sustain some level of managed resource use outside its boundaries.

Over the past six years, Floridians have begun to develop a sense of the vulnerability of the coastal ocean and of their role as stewards in the sustainable use of a national resource. However, nothing of this scale has ever been attempted in the the coastal waters of the United States and there are powerful forces arrayed against the concept of limiting growth and regulating human behaviour for sustainable use of the marine environment. We must develop the political will to take the opportunity afforded by the Sanctuary to work towards sustainability of marine resources. Until this happens, the fate of the "American Tropics" remains in doubt. ■

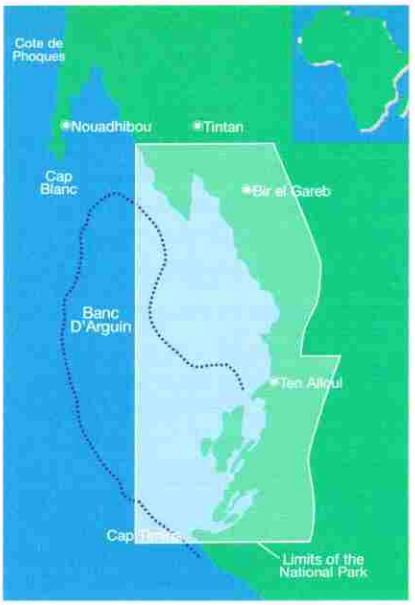
John C. Ogden is Director of the Florida Institute of Oceanography, Professor of Biology at the University of South Florida, and a member of the SeaWeb Spokesteam. From 1991-1997, he was a member of the Advisory Council which drafted the Sanctuary Management Plan.

Michael Gunther/Still Pictures

Main picture: Sea grasses

Africa's largest and most spectacular marine park, in Mauritania, is under enormous pressure from within and without. **Pierre Campredon** and **Meg Gawler** report on the master plan to secure the future of this beautiful World Heritage Site.

A visionary plan for the Banc d'Arguin



Stretching for 12,000 square kilometres, half sea and half desert, the Banc d'Arguin is the largest marine park in Africa, harbouring a spectacular web of biodiversity. Its calm waters include the Mediterranean monk seal, numerous cetaceans including the rare Guinean dolphin, marine turtles, the largest population of nesting seabirds in West Africa, as well as the world's largest concentration of two million migratory waders every winter.

The vast shallow expanses of seagrasses, together with the inflow of nutrient-rich waters from upwelling currents offshore, makes the Banc d'Arguin highly productive. It constitutes Mauritania's most important reproduction and nursery area for fisheries – the country's major economic resource.

As catches decline along the African coast, fishers are increasingly attracted to this legally protected area, where most resources are still abundant. How is this park, with few means at its disposal, to ensure the protection of such a huge and important marine area?

An early strategy, dating from the creation of the park in 1976, was to maintain – within the limits of the park – the small communities of resident fishers, the Imraguen, and to give them exclusive fishing rights to the area, using traditional non-motorised methods. By protecting their own resources, the Imraguen have become the "defenders" of the park, providing a level of surveillance from their own sailboats that the park administration would be unable to carry out alone. Here, having people within the park is a solution, rather than a problem.

However, the rapid evolution and globalisation of the world's fisheries is posing ever-increasing threats. For example, the Imraguen, who are among the poorest people in Mauritania, are now solicited by middlemen for the shark-fin market in Asia, where prices exceed US$100 per kilogram. In recent years an important shark and ray fishery has developed within the park, and some species, such as the saw-fish, have already disappeared, victim of demand from the other side of the planet.

Furthermore, as the Imraguen, who have always depended on subsistence fishing, have been pushed into a market economy, the very foundations of their society have been profoundly shaken. Worse, since sharks and rays cannot be fished intensively because of their long reproductive cycles, this new market economy is unsustainable and likely to crash.

In order to address problems such as these the Banc d'Arguin National Park, with the technical and financial support of its partners, has developed a ten-year Master Plan, negotiated with all major stakeholders, and approved by the Mauritanian government. The master plan is based on five major objectives:

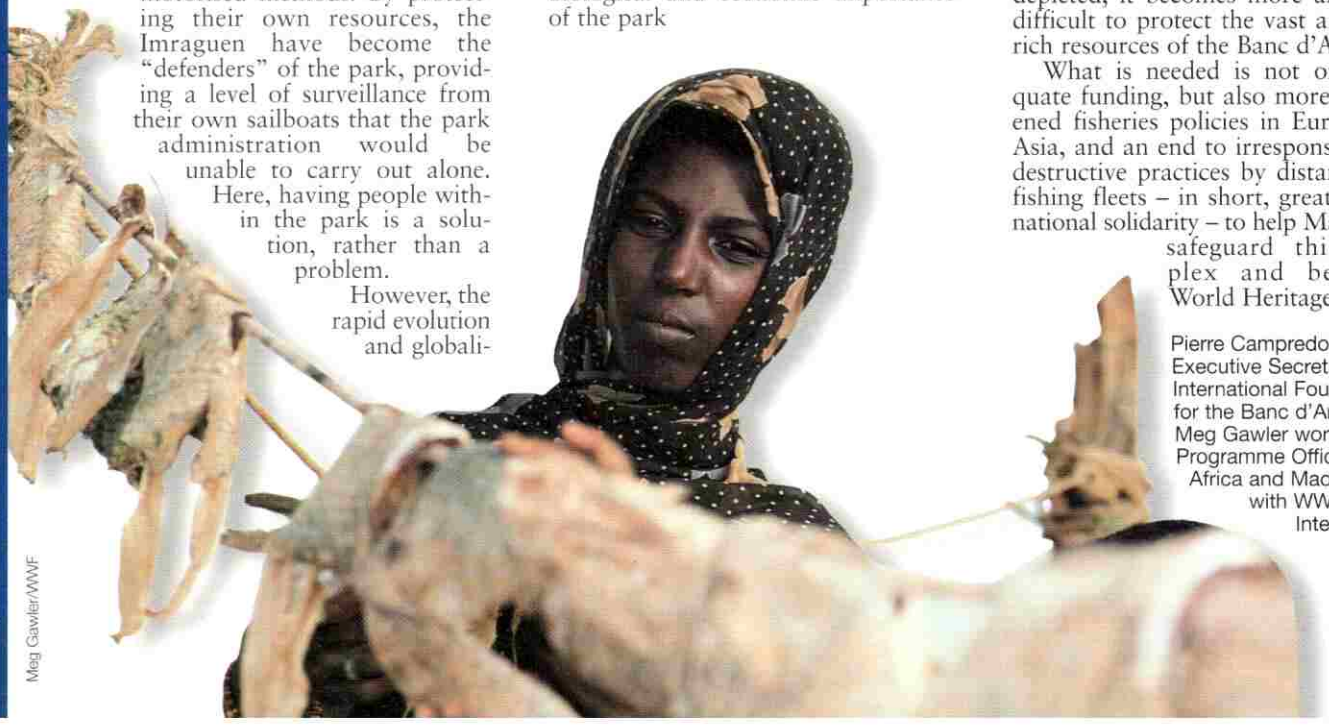
- establishing efficient management systems
- protecting the park and its resources
- scientifically demonstrating the biological and economic importance of the park
- improving the Imraguen's living conditions together with the park's economic and aesthetic values
- strengthening partnerships.

In order to implement the plan, new park regulations have been defined in the context of modern realities. During a three-day workshop under a big Moorish tent in one of the villages in the park, draft legislation was developed directly with the representatives of the Imraguen communities. One important accomplishment of this participatory planning was reaching agreement to limit the total number of Imraguen boats to 100, in the interest of ensuring a sustainable level of fishing effort.

However, not all problems have been solved. Among the most thorny are the pirate fishers: small-scale fishers from Mauritania and Senegal, and industrial vessels, often from Europe. In response to these threats, the park and its partners have raised funds for three rapid patrol boats.

In spite of the concerted efforts of the Imraguen, the park, and its partner organisations, the future gives great cause for concern. Never have the internal and external pressures on the park been so great. As marine resources outside are increasingly depleted, it becomes more and more difficult to protect the vast areas and rich resources of the Banc d'Arguin.

What is needed is not only adequate funding, but also more enlightened fisheries policies in Europe and Asia, and an end to irresponsible and destructive practices by distant water fishing fleets – in short, greater international solidarity – to help Mauritania safeguard this complex and beautiful World Heritage Site. ■



Meg Gawler/WWF

Pierre Campredon is the Executive Secretary of the International Foundation for the Banc d'Arguin. Meg Gawler works as a Programme Officer for Africa and Madagascar, with WWF International.

Why should we care?

How we look after the ocean will determine the future of life on earth – forever – says **Sylvia Earle**.

"Why should I care about the ocean? People don't drink salt water. I can't swim, I don't eat fish, don't like boats and – I get seasick. If the ocean dried up tomorrow, what difference would it make? Who needs the ocean?"

My first reaction to this challenge from a young reporter in Australia was indignation; then I glimpsed a suppressed smile and played along. "Okay," I said. "Get rid of the ocean and what would Earth be like? Probably a lot like Mars. Cold, barren, inhospitable."

Inspired, I went on, thinking of the many ways the ocean affects all of us, all of the time, no matter where on the planet we live.

Living soup

From afar, I mused, astronauts quickly grasp the truth: Earth is dominated by the sea. In short, the ocean is our life support system, the driving force behind climate and weather, the key to temperature regulation, the source of most of the oxygen in the atmosphere, the place where enormous quantities of carbon dioxide are absorbed. It is also home for most of life on Earth. Water is the single non-negotiable thing life requires, and this planet is blessed with lots of it, most of it – 97 per cent – ocean.

Every time I slip on a face mask and flippers and dive into the sea, it is like diving into the history of life. Even a bucketful of seawater may hold a living soup of young planktonic sponges, jellyfish, starfish, arrow worms, peanut worms, annelids, crabs, bryozoans, fish, and much more. Most of the 30 or so phyla and dozens of classes of life that have ever existed on Earth still prosper in the sea, and about half occur only there. Some, such as the groups that includes horseshoe crabs and the once numerous lamp shells are today represented by only a few species, but others, such as the annelids, are so species-rich that their numbers may rival insects. A few feet from any shore, it is possible to encounter more of the broad categories of plants and animals than can be found in the richest terrestrial forest, meadow or swamp.

In the past half century, new discoveries have been made that are bringing into focus the many ways this living ocean affects humankind. The recent El Niño phenomenon, a fluctuating current off the coast of Peru, has made people worldwide aware of the global connections among ocean currents, winds, rainfall, temperature, crops, flooding, drought, the stock market – and the economies of nations far removed from the western coast of South America.

The sea always has been valued as a liquid highway, dividing and uniting cultures worldwide, sometimes serving as an important arena for aggression or defence. It has also yielded a treasure trove of history, especially in recent years as new technology has made possible the recovery of long-lost artifacts from ship wrecks and has revealed ancient shorelines. New access to the deep sea has begun to provide insight into the nature of earthquakes and other grand earth processes that have direct impacts on the lives of people far inland. Oil and gas reserves under the ocean are being tapped and used worldwide, and alternate energy sources explored, ranging from power derived from waves and tides to the thermal differential between cold, deep water and warm surface temperature.

Distilled energy

The past 50 years have not only yielded new discoveries about the ways the ocean affects humankind. Increasingly, there is evidence of the many ways that we are affecting the ocean.

One way is through the large quantity of life we take from the sea. People don't consume many marine plants directly, but every time we make a meal of tuna, swordfish, mackerel, cod, haddock, halibut, shark, rockfish, flounder, orange roughy, lobster or dozens of other commonly served sea creatures, we consume the distillation of energy generated by millions of microscopic creatures. It takes thousands of pounds of minute planktonic plants working through complex food chains to produce a pound of most of the fish that people eat – top predators that are to the sea what lions, tigers, eagles and owls are to the land.

Extraction of hundreds of millions of tons of wildlife from the sea in the past few decades has begun to alter the nature of ancient ocean ecosystems. Once abundant species have collapsed and entire ecosystems, from coral reefs to kelp forests, are showing clear signs of stress.

If the ocean did not matter to the future of humankind, perhaps we could justify using the waters of the world as a convenient place to dump sewage and discard whatever we don't want nearby where we live. Perhaps we could extract wildlife without worrying about the sustainability of populations of fish, whales, shrimp, oysters, seaweed, crabs and clams – as well as the many other forms of life that comprise the living sea. Perhaps we could continue behaving much the same way that we do right now.

Still Pictures/EIA

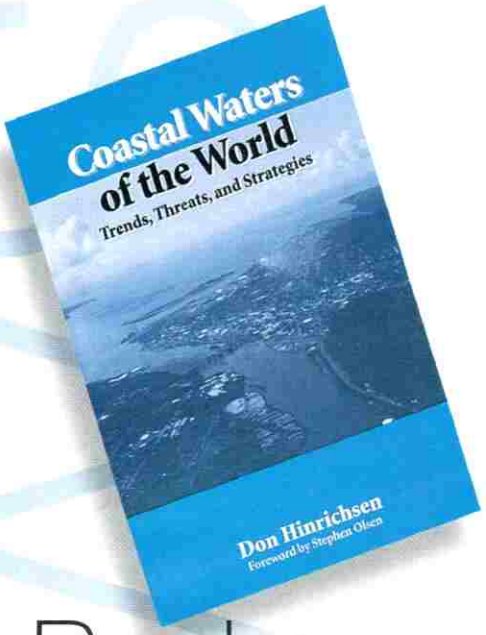
Dying reefs

However, we have learned enough in the past half century about the importance of the ocean to human survival and wellbeing to understand that we must change our ways – if we are to have an enduring, prosperous future. Dying coral reefs, sharp declines of more than a hundred once-common species of fish, a growing anoxic "dead zone" in the Gulf of Mexico, a 50 per cent loss of shoreline mangrove forests, increasing abundance and extent of toxic algal blooms – are among recent signs that the ocean is in trouble. The ocean is our life support system. If it is in trouble, so are we.

This would be terrifying news but for one thing. During the same few decades when we have done the most harm, we have also learned more about the nature of the ocean and its importance to our survival and wellbeing, than during all preceding human history. With knowing comes caring, and with caring, there is hope that we will seize the opportunities now available to protect the natural wild ocean systems that provide the underpinnings of how the planet works.

We have the power to eliminate – or perpetuate. The choice is ours about whether there will or will not be great whales thriving in the waters of Antarctica at the turn of the next century; whether there will or will not be cod and bluefin tuna chasing capelin and herring in the North Atlantic; whether there will or will not be coral reefs along certain shores. What we do, or chose not to do, right now, will surely shape the nature of the ocean – and our own lives – in the near future.

More sobering – but also inspiring – is the certainty that what we do, or chose not to do, will shape the future for all who follow, forevermore. ■



Books

COASTS OUT OF CONTROL

Coastal Waters of the World: Trends, Threats, and Strategies

Don Hinrichsen, Island Press, Washington DC, 1998, $60hb

"Our coastal areas are suffering from gigantism," a civil servant from Bombay tells author Don Hinrichsen. "They are becoming like Frankenstein monsters: They are too big and out of control for us to manage." This fear of the current plight of the planet's coasts as the global population migrates to where water meets land is the thread running through this book.

Don Hinrichsen is not a scientist or economist. But he is a first-rate working journalist. In that role he explores the state of our coasts today, how they came to be in that condition, and the future challenges and complexities of managing their resources. Hinrichsen delivers a call for attention to the pressures being inflicted on coastal resources that is clear and compelling to any reader.

The author bolsters his presentation with demographics and statistics that make the case for the need for immediate action to sustain coastal resources. He does this without overwhelming the reader or neglecting the need to substantiate the anecdotal claims of his many sources and interviewees. He has travelled extensively, and done the legwork required to bring the real voice of coastal residents into play to create an on-the-scene vision of living on the edge.

This is epitomised by his prologue on the island-dwelling Kuna Indians of San Blas, Panama. These effective *de facto* coastal managers have long recognised the value of the resources that surround them, and succeeded in working to sustain their use. This stewardship effort has been accomplished in the face of substantial outside pressures, including direct confrontation with the Government of Panama itself.

Hinrichsen emphasises the need for such local ownership of coastal management efforts – hopefully in combination with top-level policy guidance – the necessity of an informed process of governance, and the benchmarking and evaluation of coastal projects as key strategies to effective management. He also calls upon his colleagues in the media to take responsibility to help disseminate knowledge about coastal issues.

By breaking down the main body of the book into an evaluation of the coasts along the world's regional seas, Hinrichsen provides a logical and concise way to compare and contrast past and ongoing efforts in coastal management. Combined with the tightly-focused case studies, this body of information allows the author to lay out the bigger picture – one which drives his summary recommendations. These identify the need for global alliances that weave together current management initiatives worldwide.

Coastal Waters of the World provides an excellent overview of the variety and value of the world's coastlines, and the effort to ensure their qualities are not forever lost. Coastal professionals are often asked by laymen what they are attempting to do. If that inquisitive person really wants to know, this is the book to hand them.

Lynne Zeitlin Hale

Lynne Hale is Associate Director of the Coastal Resources Center at the University of Rhode Island, USA, and has led the Center's field projects in Sri Lanka, Thailand, Indonesia, Kenya, Tanzania and Mexico, among other international and US sites.

WONDROUS WATERS

Song for the Blue Ocean Encounters along the World's Coasts and Beneath the Seas

Carl Safina
Henry Holt, New York, 1998, $30.00

Fifty years ago, Aldo Leopold's *Sand County Almanac* inspired a generation to begin conserving North America's wild lands and their wildlife. But while the terrestrial conservation movement grew and flourished, the oceans and their wildlife continued to suffer, largely out of sight and out of mind.

At last, someone has published a book that may change all of that. Carl Safina has written the *Sand County Almanac* of the sea.

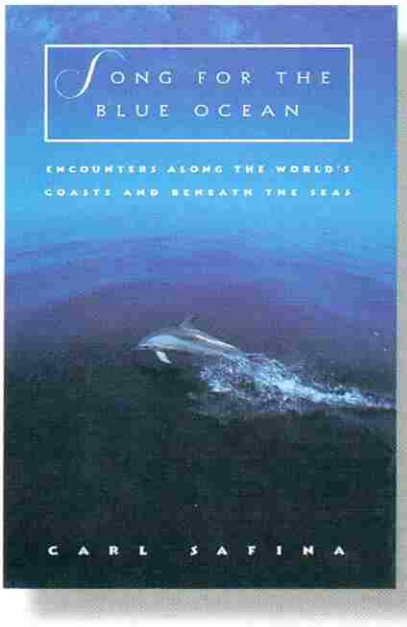
Song for the Blue Ocean is a chronicle of personal experience and received wisdom in the fight to save our oceans and their wildlife. Safina takes us to New England, to discover the precarious and controversial status of the magnificent and valuable Atlantic bluefin tuna and swordfish. We travel to the great Pacific Northwest, where we learn of the myriad threats to the once-mighty runs of salmon, animals whose lifestyle Safina describes as "so seemingly heroic as to appear mythical." And we go far out into the Pacific, where we experience efforts to combat the threat of cyanide fishing to the coral reefs of Palau and the Philippines.

At once richly evocative and profoundly moving, Safina's prose is also refreshingly readable for that of a scientist. His descriptions of the ocean environment and its fishes betray this writer as a knowledgeable man with deep passions and convictions for the ocean and its creatures. Equally evident are Safina's sense of humour, humanity, and genuine respect for the people he meets along the way, even those with whom he disagrees.

But *Song* is much more than a paean for the oceans, their wildlife, and the people who depend on them. It's an exposé of the enormous threats to the marine environment and a stinging indictment of the status quo. Safina condemns the complacent bureaucrats, political compromises, corporate greed, and "calculated misanthropy" that have destroyed the species and places he loves. *Song* is a powerful and eloquent call to action for all those who love the sea, the livelihoods it fosters, and the wondrous biological diversity it harbours.

Michael Sutton

Michael Sutton is Director of the Endangered Seas Campaign, WWF International.



Films

NOT ALL AT SEA

Not All At Sea – a half-hour film for the BBC World Service's fortnightly Earth Report – features five marine environments around the world. It investigates the dangers that threaten them and efforts being made to protect them.

It begins in Rio with a reminder that what humans do on the land will decide the fate of the seas. As the population of Rio has mushroomed to a density of almost 3,000 people per square kilometre, vast amounts of waste flow untreated down open sewers into the bay. Up to a thousand tonnes of it ends up in the surrounding waters every day.

Fishing has been officially banned in the bay, bathing is hazardous and water-borne diseases such as cholera have become a serious health risk. Rio is one of the worst examples of the way uncontrolled pollution from the land can be allowed to destroy a marine ecosystem, and this report shows just how badly things can go wrong.

Pollution is not the only problem that faces the world's fish. Worldwide, over 100 million tonnes of fish are taken every year and 70 per cent of all marine stocks are either fully fished or worryingly depleted.

But it is not all bad news. The film follows some fishermen in England's Essex estuary, who are taking part in a pilot project to encourage sustainable fishing by regulating the catch of fish from the North Sea. At the global level an unlikely partnership has been formed to build a more optimistic future for fishing. Unilever, the Anglo-Dutch food multinational, and the world's largest seafood supplier, last year joined forces with the World Wide Fund for Nature to set up the Marine Stewardship Council, which aims to reassure customers that the fish they buy have been caught sustainably.

The third story in this report is part of the *Hands On* slot which features small scale business initiatives to promote sustainability. It takes us to Somalia where young boys in Mogadishu are learning to swim, handle boats and braid their own fishing nets. The Somali Red Crescent Society has launched an aid project to kick-start a small scale fishing industry – boosting the local economy and inspiring a new-found taste for fried fish.

Turning to coral reefs, the film investigates threats to reefs in Sri Lanka, Colombia and the Seychelles to see whether tourists can be involved in protecting rather than destroying them.

A final segment explores one of the frontier environments between land and sea – the mangrove forests of the Sunderban in Bangladesh and India. They face many threats. The shrimp farms that have ravaged much of India's coastline, are spreading fear here too – with forest and paddy fields turned into farms by the Shrimp Lords who tyrannise local people to supply European and Asian restaurant tables. And a mysterious threat looms. No one is quite sure why, but the productivity of the forest is declining, and saltiness of the water increasing. The Sunderban will be one of the first places to suffer permanent salt water inundation if global warming leads to a sea level rise.

Zoe Stephenson

Not All At Sea is available from:
TVE Distribution Office, Prince Albert Road, London NW1 4RZ
Tel: +44 (0) 171 586 5526
Fax: +44 (0) 171 586 4866
E-mail tve-dist@tve.org.uk
Website: www.tve.org

Last word

Cousteau's call

Twenty years ago, Jacques-Yves Cousteau – who died last year after a lifetime of campaigning for the seas – called for a people's crusade to protect them. The words he spoke then still resonate.

Those of us who love the sea, who recognise the blood relationship of all earth's beings, who see on this Water Planet a growing threat to our most fundamental biological machinery, do not command the money and power of even a single major multinational corporation.
But we can wield the formidable power of our numbers, the strength of a great unified crowd of citizens of the planet...and the most effective weapon we have as citizens – as parents – is the sheer force of our numbers. It is the weaponry of the peacemakers and the common people throughout history...With the support of a massive constituency of concerned people, our demands for new policies to protect the seas, and all of the earth's delicate living systems, would be backed not only by scientific data but by political clout...
For all the darkness that presently confronts us and our descendants, there is no reason to give up. There is every reason to take up the fight, because we have within our grasp the power of the people to force the right decisions.The more people, the more power, the more hope.

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To know more about The Cousteau Society see their web site at: www.cousteau.org

The Cousteau Society

YEAR OF THE TIGER

David Lawson/WWF–UK

Unless a series of actions are taken to protect existing tiger populations, there will be very few of the magnificent felines left by the Year 2010, warns a report by the World Wide Fund for Nature (WWF).

The WWF Tiger Status Report: 1998 Year of the Tiger outlines a dramatic 95 per cent decline in tiger numbers over the last 100 years. In just 50 years, three of the eight tiger species – the Bali, Caspian and Javan tigers – have already become extinct, and the South China tiger risks the same fate as only 20 or 30 are known to remain in the wild (down from an estimated 4,000 in the 1950s). Altogether there are anywhere between 5,000 and 7,500 tigers left in the wild, mainly in national parks and protected areas. Outside these areas, they stand little chance of survival.

As preparations got under way for celebrating the Chinese Year of the Tiger, WWF announced an International Action Plan for making 1998 the year for the tiger. The new plan gives priority to setting up an Emergency Rapid Response Fund for Tiger Conservation. The fund will be used to tackle a wide range of urgent tiger conservation problems – from countering sudden rises in the incidence of poaching, to legal changes to development projects or policies which threaten to destroy tiger habitat.

The greatest threat to tigers are the increasing pressures of explosive growth in human populations leading to encroachment on tiger habitats and steady habitat destruction, as well as the poaching and illegal trade in tigers and tiger parts for use in traditional Chinese medicine.

"The situation for tigers is becoming increasingly precarious and we need to put tiger conservation on a more urgent footing," said Dr Jean-Pierre d'Huart, manager of WWF's Species Conservation Unit. "Their populations are reaching such low levels in some parts of their range that the death of every tiger is another nail in the coffin of the species as a whole. We believe that this emergency fund is a crucial element in our battle to save the tigers."

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* A new People and Conservation unit has been established at WWF International.
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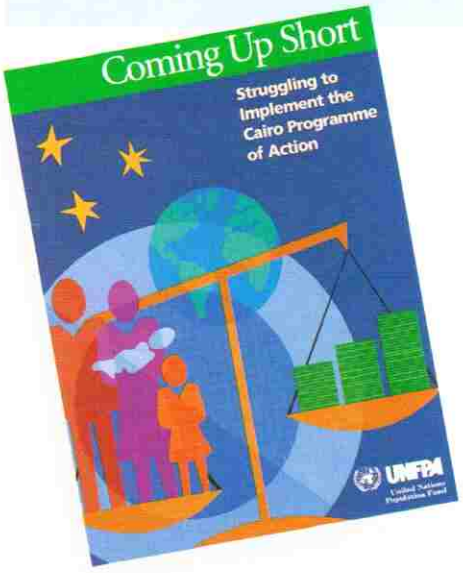


FIVE YEARS ON

Preparations are now under way for an International Forum, to be held in Amsterdam in February 1999, to mark the fifth anniversary of the International Conference on Population and Development (ICPD), held in Cairo in 1994.

The Forum will focus on key issues which emerge from a series of events over the coming year. These will review the experience so far in putting the Cairo Plan of Action into effect.

As part of the review, the UN Population Fund (UNFPA) will organise four Round Tables this year. The first of these, on adolescent sexual health and reproductive health, took place in April. Others will be held in June, July and September and will look at other key themes of the Action Plan including reproductive rights and the implementation of the reproductive health programmes, the participation of civil society, and population and macro-economic linkages.

Commenting on progress so far, Jyoti Singh, Special Adviser to UNFPA Executive Director Nafis Sadik, said "There has been a big change in attitude and approaches in many countries since ICPD, though there is a mixed picture on funding."

How the funding shortfall may affect women and their families, is highlighted in a UNFPA booklet *Coming Up Short: Struggling to Implement the Cairo Plan of Action* which warns that between 130 and 230 million additional unwanted pregnancies will occur in the period 1995-2000 if the funding targets are not met.

Another UNFPA publication, *Sustainable Development: Five Years After Rio*, provides a useful review of the broader issues to be addressed at Amsterdam.

These and other booklets are available in English, French and Spanish for $5 per copy from United Nations Publications, DC-2, Room 853, New York, NY 10017, USA. Please add $5 per order for shipping and handling. For information call: (+1 800) 253 9646 or (+1 212) 963 8302, Fax: (+1 212) 963 3489, Email: publications@un.org

SCARCE WATER

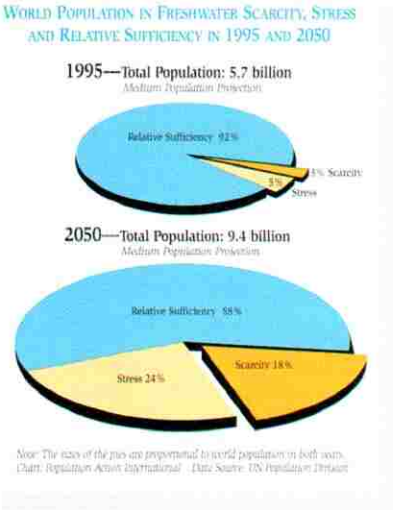
While population growth is slowing, the number of people living with water shortages is still expected to increase at least four-fold by the middle of the next century, according to a new analysis by Population Action International.

At present, some 430 million people are living in conditions of water stress or outright scarcity. By 2050, that number is expected to increase to nearly two billion, even under the United Nations low projection for

population growth, says the report.

"Worldwide, the future water situation looks brighter than it did just two years ago, due to slower projected population growth in many countries, says Robert Engelman, Director of PAI's Population and Environment Programme and co-author of the report. "Nevertheless, the pace of future population growth will largely determine whether 25 per cent, or as many as 60 per cent, of the world's people will face shortages of fresh water that seriously constrain both food production and economic development."

While the Middle East and North Africa are the regions most affected by water scarcity today, sub-Saharan Africa will be increasingly affected over the next half century, as its population triples in size, the report says.



Sustaining Water, Easing Scarcity: A Second Update, is available from PAI, 1120 19th Street, NW/Washington, DC 20036. Tel: 202/659 1833. Email: pai@popact.org

INFECTIOUS DISEASES RISE

The eradication of smallpox in the 1970s led many health experts to believe that infectious and parasitic diseases (IPDs), such as malaria, tuberculosis, cholera, as well as the more exotic ones as dengue fever, Ebola and Chagas' disease, would soon be conquered. However, the authors of a new report maintain that old diseases are appearing with increased frequency, and new diseases rarely or never before experienced by humans are emerging.

The report by the Population Reference Bureau, *Infectious Diseases: New and Ancient Threats to World Health*, maintains that the global trend towards urbanisation is a major factor in the rise of IPDs. The number of people living in cities of 1 million or more is expected to grow from 927 million in 1995 to 1.7 billion by 2015, increasing the likely spread of these diseases.

In addition to greater population density, the report points out that human actions also influence the introduction and spread of IPDs.

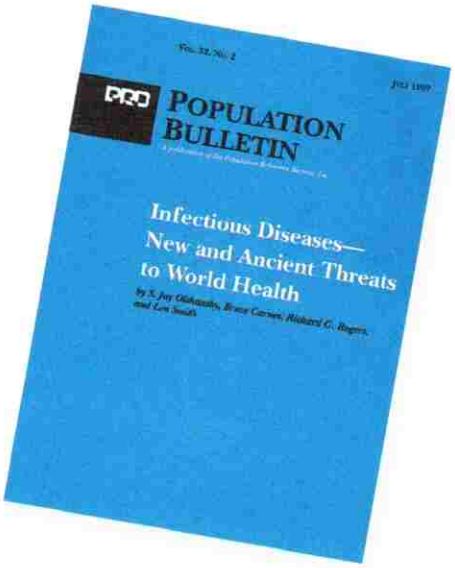
Agricultural practices such as the Chinese practice of raising pigs and fowl together enables new strains of influenza to develop and eventually enter the human population. Flooding of fields for crops can encourage mosquito breeding.

Infectious agents can easily be transported around the world in a matter of hours to any part of the world. A mosquito that carries dengue fever and yellow fever, for example, entered the United States in 1985 inside used tyres shipped from Asia. This kind of mosquito now has become established in Hawaii and at least 20 other states.

Since 1973, scientists have identified more than 28 new disease-causing microbes. These include a new strain of cholera that has killed thousands of people in Africa and Asia and new forms of tuberculosis and meningitis that are resistant to most known antibiotics. Outbreaks of such deadly diseases as diphtheria, Hantaan virus, bubonic plague, tuberculosis, malaria, cholera, meningitis, and Ebola have been reported recently.

More than 17 million people died from these diseases in 1995 – accounting for more than a quarter of all deaths. Around 97 per cent of deaths from these diseases occur in low income countries.

Among the measures recommended to stem the spread include efforts to reduce poverty, improve immunisation programmes and educational campaigns.



Copies of the report are available at $8.50 Contact: PRB, 1875 Connecticut Avenue NW, Suite 250, Washington DC 20009-5728. Tel: (+1 800) 877 9881 or (+1 202) 483 1100, Fax: (+1 202) 328 3937.

SEA CHANGE

The World Wide Fund for Nature (WWF) is dedicating 1998 to 'Creating a Sea Change' for our future. Throughout this International Year of the Ocean, WWF will be promoting two key messages – that must be acted on now:

- Reform the world's fishing industry and encourage fisheries management
- Safeguard critical ocean habitats by creating an effective global network of marine parks and reserves

1998 International Year of the Ocean
Intergovernmental Oceanographic Commission
UNESCO

WWF's Living Planet Campaign is developing a collaborative programme with EXPO, the World Trade Fair that takes place in Lisbon, Portugal from May to June this year with the theme 'The Oceans: a Heritage for the Future'. This will involve a media event on World Oceans Day (June 8), which will include the release of a new global WWF Marine Policy and a celebration of marine 'Gifts to the Earth'. Another highlight of EXPO will be the World Conservation Union (IUCN) pavilion, built in the form of a lighthouse. Created in collaboration with Portugal's Institute of Nature Conservation, the lighthouse will include an exhibition of ocean biodiversity and an audio-visual display of ocean management.

Contact: The Marine Programme, WWF International, Avenue du Mont Blanc, 1196 Gland, Switzerland. Tel: + 41 22 364 9510, Fax: +41 22 364 3239, E-mail: cbijasson@wwfnet.org

Associates' News is compiled by **Maya Pastakia** *to whom all contributions should be addressed.*

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People & the Planet

Our next issue will report on The Girl Child

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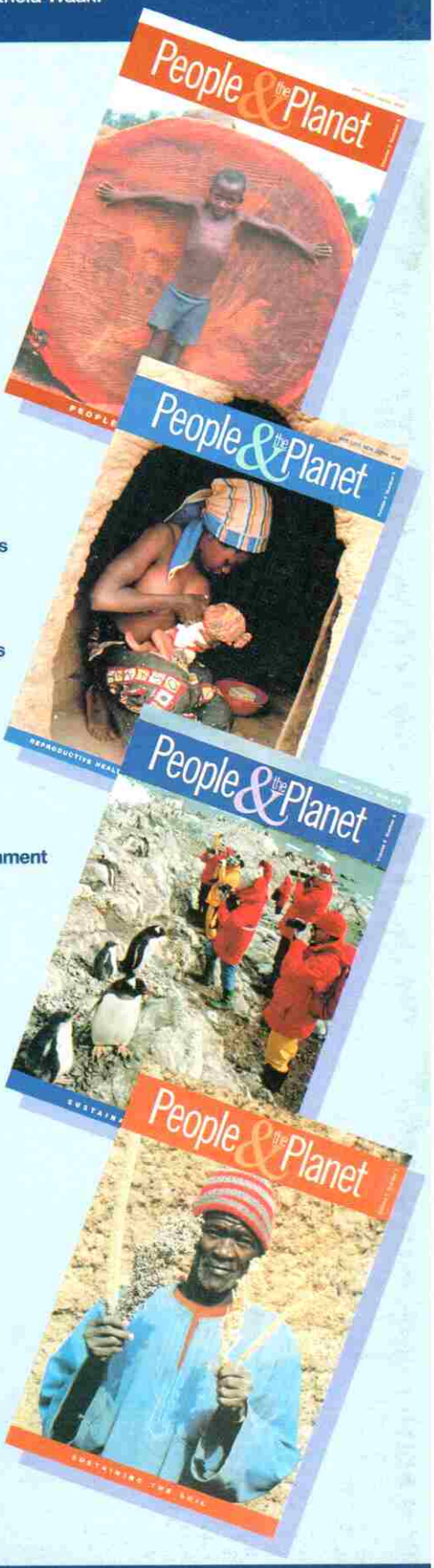

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